Heating and Ventilating

For Engineers and Contractors Controlling the Design, Specification, Installation and Maintenance of Heating, Ventilating and Air Conditioning

Volume 31 FEBRUARY, 1934 Number 2

CONTENTS

A Review of Concealed and Cabinet Convectors—Part 1 15
Reference List—Gravity Convectors 18
Design and Location of Registers and Grilles ..... *Walter J. Ottinger* 22
Community Smoke Abatement Plan 24
Adolphus Hotel and Dallas Gas Company Building Heated by Gas ..... *J. B. Nealey* 25
Design and Installation of Instrument Boards—Part 2 ..... *John A. Masek* 29
Small Motors for Air Conditioning Plants ..... *L. Gwathmey* and *B. S. Weaver* 32
New York Temperature Ranges 115° in 63 Years 34
Keeping Up-to-Date on the Code Situation 35
Few Objections Made to Proposed Steam Heating Code 38
Heating and Ventilating the Indiana University Dental School *Telford R. Davis* 39
British Study Problems of Domestic Coal Heating 42
Unfair Competition from Utilities Claimed by Oil Burner Industry 43

DEPARTMENTS

Reference Data, 27 and 28—Comfort Air Conditioning Chart ..... Opposite 34
Editorials 44
Abstracts 45
Business Briefs 47
News of the Month 50
New Equipment 56
Degree-Days for December, 1933 62
The Weather for December, 1933 64

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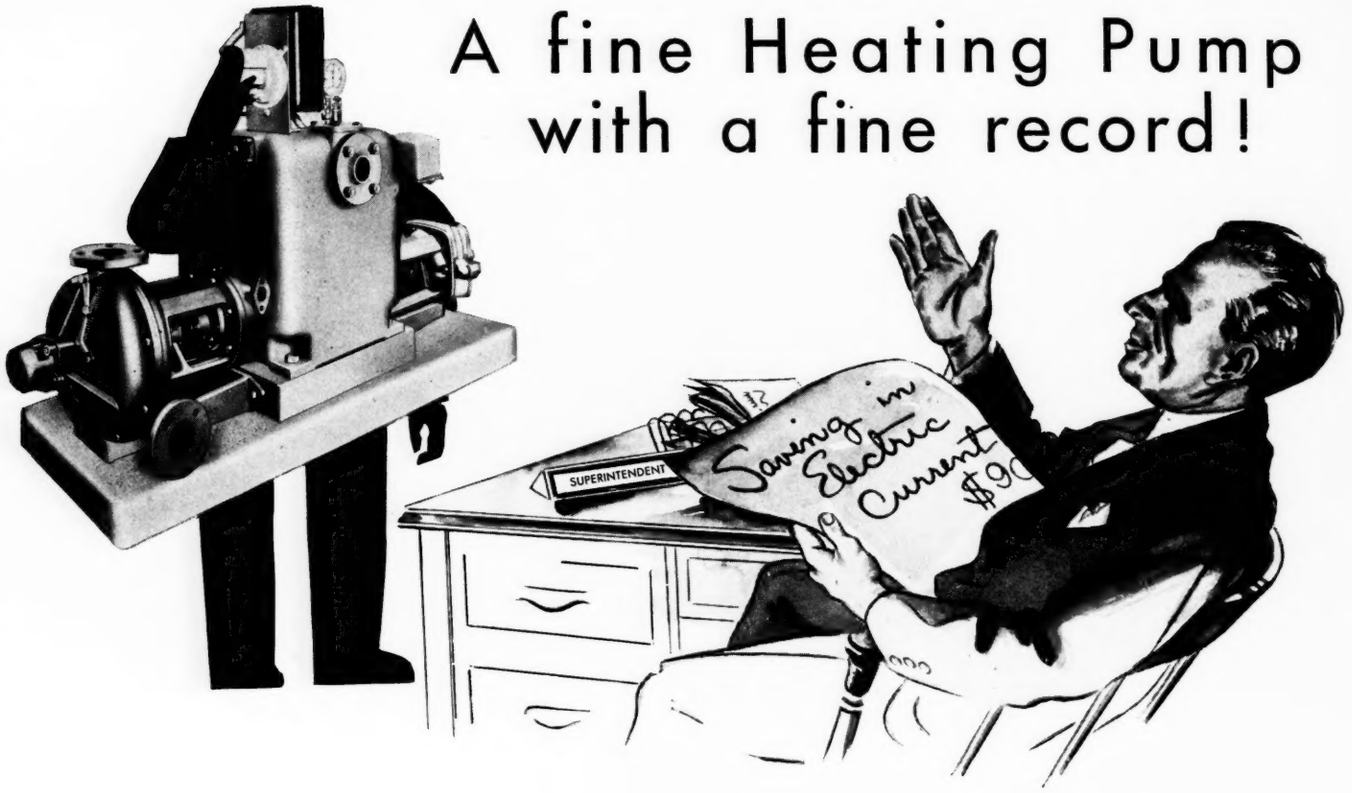
A fine Heating Pump with a fine record!



"-better heating-no electric current cost-and an actual saving in steam"

But it is all in the day's work, for the Jennings Vapor Turbine is just naturally a better return line heating pump. These new features of efficiency are built in, and in severe tests before it ever leaves the Nash plant it has to prove its ability to save you money.

The reason the New Jennings Vapor Turbine needs no electric current is because it is driven by a special vapor turbine which functions on a differential of only 5 in. of mercury. It works equally well on any type of heating system, regardless of whether it is run above or below atmosphere. And it is mighty economical, because the steam that operates the Vapor Turbine passes right back to the heating system with practically no heat loss. If you would like the exact figure, the heat given up by the steam in operating the turbine is 7/8ths of 1% of the heat in the steam.

Now electric current, as every engineer knows, is the one biggest cost item in the operation of a vacuum heating pump. Cutting that out would be a big job, even if the pump, with the turbine, consumed a little more steam. But the wonderful thing about this pump is that it doesn't! It operates on steam, and yet it actually saves steam as compared with electric driven pumps of the same capacity. This saving in steam is reflected in a marked decrease in fuel consumption reported by users of this new pump.

Any engineer will appreciate how it saves steam when we say that it is a highly perfected pumping device operating continuously, because it can operate continuously with economy. Continuous operation means continuous removal of air and condensate, i.e., the maintenance of uniform conditions in the return line. And uniform circulation means steam saving.

We could tell you of many other ways in which the Vapor Turbine is economical. Cost of lubrication and maintenance is practically nothing. Little floor space is required. No expert attendance is needed.

But why don't you send for Bulletin 203 and learn all about this new way of keeping every radiator at top-notch heating efficiency, and with economy.

THE NASH ENGINEERING COMPANY

SOUTH NORWALK, CONNECTICUT, U. S. A.

Convector Heaters Available in Many Forms, Materials, and Sizes

PART 1

A study of the thirty-one convectors now commercially available

HEATING by convectors has gone a long way on the road to popularity since the days some seven or eight years ago when the first commercial unit made its appearance. These units have passed through the period when they could be indiscriminately termed copper or lightweight radiators, for cast iron has been introduced into the manufacture of some; they can no longer be freely termed concealed heaters, as a group, because some are installed exposed; in fact, strangely enough, we cannot even class them altogether as convectors, for just as the old "radiator" gave off an important part of its heat by convection, so do some of the so-called "convectors" give off a considerable portion of their heat by radiation; the phrase "heating effect" has come into fairly common use. Altogether, a lot has been done.

So much has been done that to attempt to cover the subject of convectors adequately would require a fair-sized book. So far, this has not been, to our knowledge, attempted. In this and a succeeding article we hope, however, at least to acquaint readers with, first, what is commercially available in convectors today by examining their physical construction carefully and, second, to review briefly some of the characteristics of these convectors, and what they accomplish.

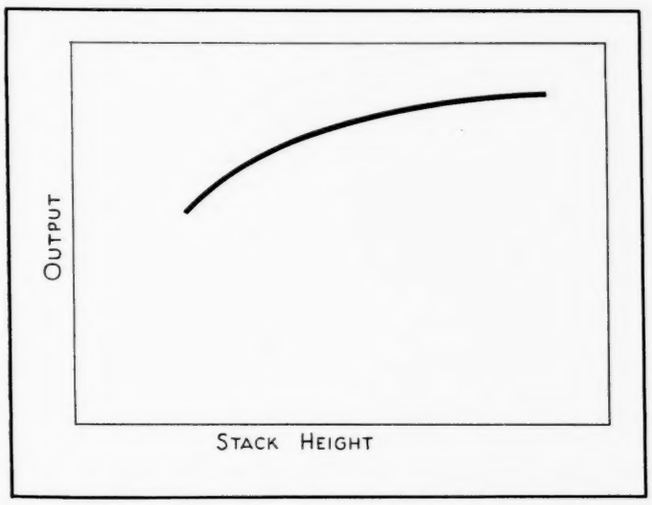
Not all convectors are included. In order to keep the ground to be covered within reasonable limits, only convectors operating wholly by gravity and supplied with steam or hot water from an outside source are included. We have ruled out some types of unit heaters and unit ventilators which ordinarily operate as forced units, but which may act by gravity. The term "outside source" likewise excludes enclosed gas-fired radiators, electric convectors, and oil-burning enclosed radiators, all of which are self-contained heating appliances.

Types

With almost any of a number of ways convectors can be classified, one finds that the majority falls in one group. If they are classified by material, most are copper. If the position of the element is the basis of grouping, most units will be found to be horizontal, with a few vertical and a few inclined. The method of classifying adopted here has been the construction of the element.

The accompanying sketches illustrate the various types which cover most of the available convectors, but not quite all. It must be noted that the sketches are only for the purpose of illustrating *broad* general types and are not necessarily typical of all grouped under that type. For example, Type A shows an element with a shallow fin, with a greater depth and height. Many of the units listed as Type A will be found to have a greater height and depth but, nevertheless, the sketch is sufficient to show the general idea of Type A—a tube with numerous thin fins at right angles to the tube.[1]

[1]Neither do the sketches show how the element lies in its enclosure. This will be shown in numerous illustrations in the subsequent article.



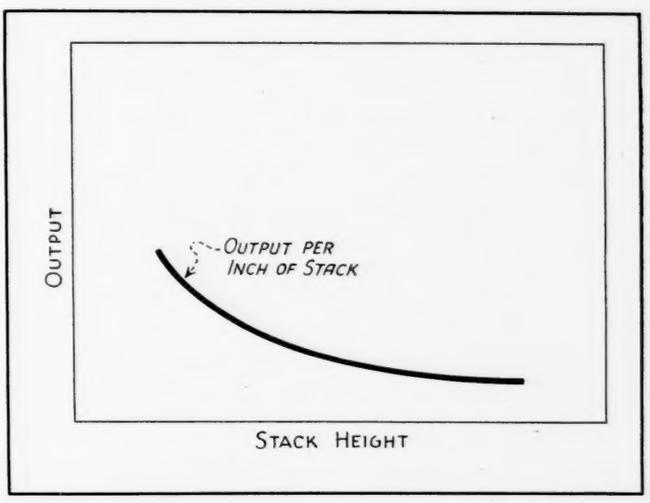
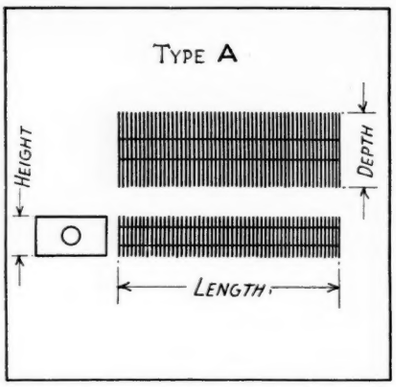
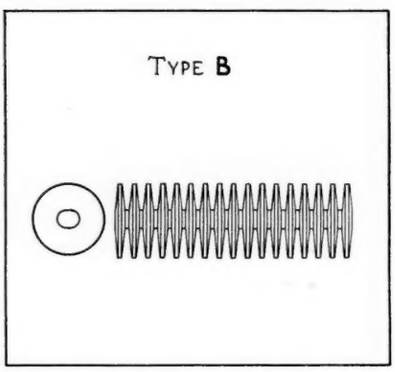
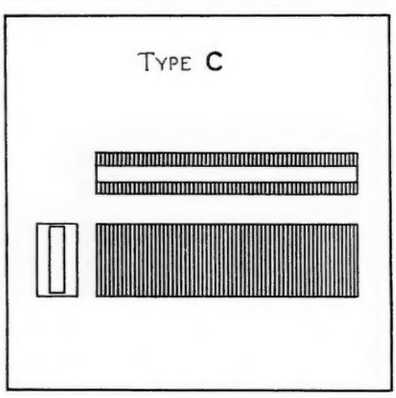
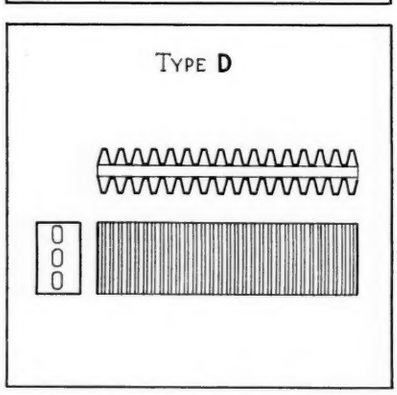


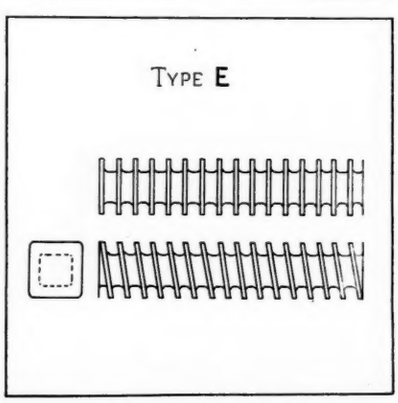
Fig. 1. (Left) How the capacity of a typical convector varies with the stack height. Fig. 2. (Right) Additional height of stack yields increased capacity at a decreasing rate.











Type B is a cast affair with fins of relatively heavy construction, circular and concentric with the tube and, of course, integral with it. Type C is not so different from Type A, except that the heating medium is contained in a chamber, and not a tube. A wedge-shaped core would be classified as C. Although the sketch shows the chamber to extend to the top of the fins this is not always the case.

Type D is one with (usually) multi-tubes or chambers running longitudinally, with thin metal fins folded or bent back and forth along the sides. Type E, a casting, differs from B in that the form is square or rectangular rather than circular, and that the extended surface is inclined, or at an angle to the air flow, rather than parallel to it. Type F illustrates various arrangements of combination convectors and radiators.[2]

Of the 31 units classified, 26 fall under types A to E inclusive. Strictly speaking, the combination units are not classified on the basis of the element inasmuch as the heating element is not the only heating surface in the convector. The element is more or less an integral part of the whole unit. Consequently, the illustration shows the arrangement of the whole radiator. The view to the right of Type F-1 shows the exposed part of the unit, while the view to the left shows a section with two convector elements mounted back of the "radiator" part. Type F-2 is an unusual arrangement of a tube with a sheet metal cabinet acting as extended surface and, in addition, as the radiator itself. Type F-3 illustrates another unusual type, showing one section of a number of such sections which, when fastened together, form a complete convector-radiator.

Of the units now on the market, 16 can be classed as Type A, or modifications of this type. Two are grouped under Type B, four as Type C, two each of Types D and E, and five falling under Type F, the combination convector-radiator classification.

Material

Examination shows that when classified by material, the number of units made of each of the materials are as follows:

Material	Tubes or Chamber	Extended Surface
Copper	18	17
Cast Iron	7	7
Steel	3	4
Aluminum	2	3
Brass	1	—

Thus, we find that over half of the units available are made of copper, with about a quarter made of cast iron, the remainder being distributed among steel, aluminum, and brass.

Enclosures

Convectors are available in three general types of enclosures: the totally concealed, the cabinet, and the partly-concealed type. The first—probably the most popular—is usually installed in the wall where stack heights of from 18 in. to 7 ft. are available, although the recommended dimensions are usually more nearly the greater dimension than the smaller, since the capacity of the heater increases with the stack height, as shown in the graphs, Figs. 1 and 2.

The cabinet type resembles an enclosed radiator and ordinarily is set under a window, completely exposed.

The partly-concealed, or semi-recessed type, is commonly installed under a window with part of the cabinet extending into the room, and part being hidden by the wall. Many makers supply the semi-recessed type with either front outlets, which discharge the air into the room horizontally, or with top outlets or grilles, which form the inside part of the windowsill.

[2]Two of the combination types have not been illustrated, the Florzone and the Modine Copper-Cast. These will be illustrated in the next installment.

Of the manufacturers listed, 28 supply concealed radiators, 22 cabinet type convectors, and 13 semi-recessed units. In addition, one maker has available a unit for installing below the floor, one a wall-hung unit, and in three the unit itself acts as its own enclosure.

Types of Front

Fronts for the enclosure where concealed or semi-recessed can consist of a metal panel, suitably decorated, which can be removed, making the heating element totally accessible, or the front can consist of an unfinished panel which acts as a base for plaster, and the front plastered in, leaving only the top or bottom grilles removable. In some cases, the grilles themselves can be part of the wall or constructed of tile or other suitable material.

Of the available units, 21 can be obtained in both panel and plastered in front, while 4 makers supply the panel type only. Five makers supply units which act as their own front while one has a convector which is available as a panel front which can be installed enclosed.

Ratings

The reference list which accompanies this article lists (from the manufacturers' catalogs) the maximum and minimum capacities of the various convectors in square feet of equivalent direct steam radiators. In most cases, an allowance has been made for the so-called "heating effect." That is, a percentage allowance has usually been made over and above the condensing capacity of the unit to allow for the better heat distribution obtained with the convector.

Nothing has been said in the list about the use of convectors with hot water systems. Many manufacturers do not specifically recommend convectors for hot water systems, but some do. A number of manufacturers do not recommend the use of convectors with one-pipe steam systems but, as with hot water, this is not true in all cases. If the user desires to install convectors with either hot water or one-pipe steam this matter should be taken up with the individual manufacturers to determine in each case what the ratings are and what the recommendation of the manufacturer is regarding these type systems.

Special Type Units

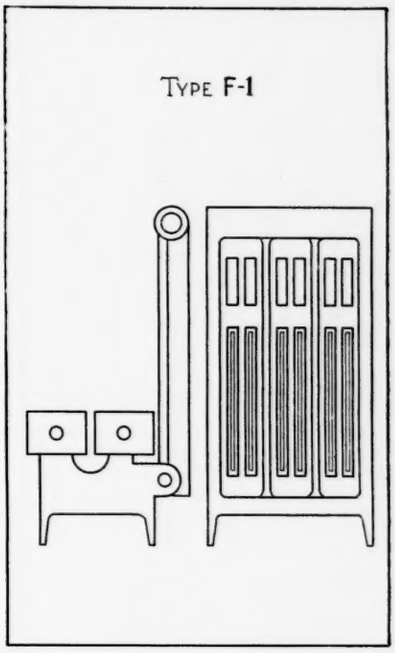
In addition to the convectors listed, a considerable number of the manufacturers state that they are able to supply specially designed units for specific applications. In addition to this, nine makers have available a special type convector for bathroom use and five have made provisions for supplying humidifying apparatus as part of the device. One manufacturer sells his convector in connection with such a humidifying device. Further, one manufacturer states that he is about to announce a humidifying convector.

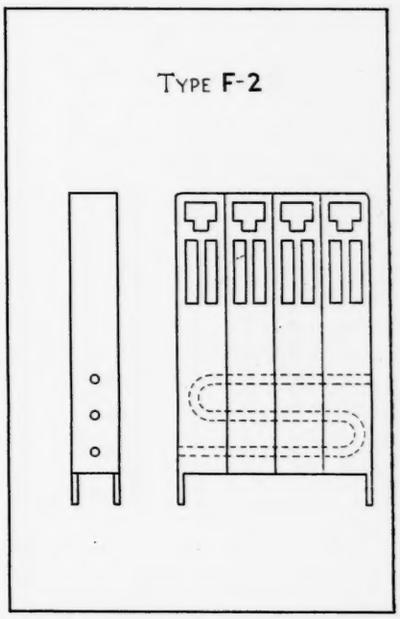
Control

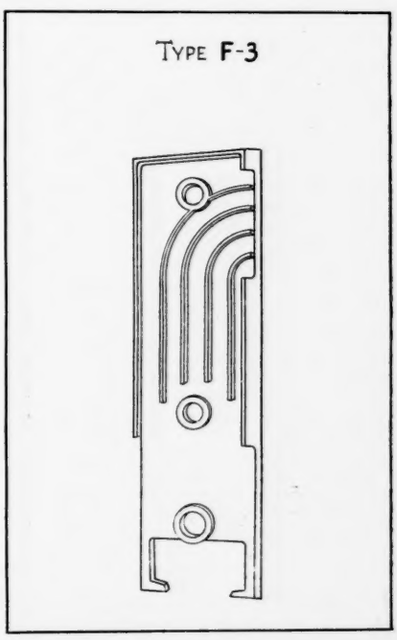
The heat output of convectors can be controlled in two ways: The steam supply can be regulated by a valve, as it is with direct radiators, with the valve handle so located that it is easily accessible; or control can be obtained by using a damper in the air stream over the convector. By shutting off the damper the air is stopped from circulating. In some cases convectors are provided with both types of control.

The four pages which follow list in convenient form the essential information on available convectors to enable the reader to obtain a good idea of the field. The list is not intended to replace the makers' catalogs, which are available on request.

The concluding installment of this article, which will appear next month, will illustrate all of the various types of units in some detail.







REFERENCE LIST—

TYPE (Letters Refer to Types Illustrated elsewhere in this article)	CONSTRUCTION OF ELEMENTS		ENCLOSURES		
	TUBES OR CHAMBER	EXTENDED SURFACE	TYPE OF FRONT	TYPES AVAILABLE	STACK HEIGHTS
D—but has multiple oval tubes. Extended surface extends over top and bottom as well as from sides	Copper tubes with cast iron headers	Copper sheet bent to form flues	Panel or plastered in	Concealed, recessed, semi-recessed or cabinets	14 heights from 11 in. to 60 in.
E—a multiple assembly of elements of this type	Cast-iron chamber and headers	Cast iron integral with chamber	Panel or plastered in	Concealed, recessed, semi-recessed or cabinets	12 heights, 11 in. to 50 in.
This unit is attached to the baseboard or is partly recessed. It is a combination convector and radiator	Steel tubes	Steel or copper fins	—	Exposed or semi-recessed	—
A—a multiple tube arrangement of this type	Copper tubes	Copper	Panel front, or can be installed exposed	Concealed or exposed	Up to 10 in.
A—a multiple arrangement of this type, with greater element height than width	Copper tubes—2, 3 or 4	Copper fins with annular ring reinforcement	Panel or plastered-in	Concealed, semi-recessed, or cabinets	7 overall cabinet heights, from 12 in. to 25 in.
A—a multiple tube arrangement of this type	Elliptical copper tubes	Copper	Panel or plastered-in	Concealed, semi-recessed, or cabinets	17 heights, from 12 in. to 65 in.
A—	Copper tubes	Copper	Panel or plaster	Concealed or cabinet, or below-the-floor types	7 heights, from 18 in. to 50 in.
A—with single or multiple tubes, depending on size	Copper tubes	Copper	Panel or plastered-in	Concealed or cabinets	20 in. to 32 in.
B—a multiple arrangement of this type	Copper tubes	Copper, corrugated	Panel	Concealed or cabinets	16 in. to 48 in.
A—with multiple tubes	Steel chamber	Steel	Panel	Concealed	20 in. to 30 in.
C—with wedge shaped core	Cast aluminum	Aluminum	Panel or plastered-in	Concealed	20⅜ in., 24⅜ in., and 30⅜ in. and special
A—can be classified under this type only in a broad way. Unit stands almost vertically, with fins inclined at about 45° to air flow. Single or multiple tubes	Seamless steel tubes	Steel	Panel or plastered-in	Concealed	Between top of lower and bottom of top regular: 56 in.
A—a multiple arrangement of this type	Copper tubes	Copper, vertically corrugated	Panel or plastered-in	Concealed or cabinets	8 heights, 20 in. to 60 in.
A—with multiple tubes	Copper tubes	Copper	Panel or plastered-in	Concealed, recessed, or cabinets	18 in. to 70 in.
Combination convector and radiator	Copper tubes	Copper	Cast-iron, containing steam chamber	Concealed, semi-recessed or cabinets	3 heights, 20 in., 25 in., and 28⅜ in.
E—multiple assembly of this type, distinctive in that units are installed crosswise of enclosure and at an angle	Cast-iron chamber	Cast-iron integral with chamber	Removable metal panel or plastered-in	Concealed, semi-concealed or cabinets	A wide range of enclosure heights from 20 in. to 7 in. Stack height approx. 7 in. less than enclosure heights

GRAVITY CONVECTORS

SIZE OF ELEMENTS		CAPACITIES, SQ. FT. STEAM E.D. RADIATOR	REMARKS	TRADE NAME	MANUFACTURER
DEPTH	LENGTH				
2⅜, 3¾, 5 6⅜, 7¾ and 10⅜ in.	20 lengths, from 12½ in. to 60 in.	5.9 to 119.6	Maker also offers a bathroom convector	Murray	American Radiator Company
3¾, 5⅝, 7⅝ and 9½ in.	19 lengths, from 13 in. to 60½ in.	6 to 108.8	Maker also offers a bathroom convector	Arco Convector	
4 in.	18 in., 27 in., 36 in.	12 to 24. Can be installed in double tiers, with 24 to 48 sq. ft. capacity	Due to its position near the flow, advantages claimed include low temperature differential between floor and ceiling	Florzone	Automatic Florzone Heating Company
4 in.	10 lengths, from 36 in. to 144 in.	15 to 60	Unusual type in that it has very low stack heights and is sold only in connection with an automatic humidifying device	Bon-Air	Bon-Air Radiator Corporation
5 depths, 3¼ in. to 8 in.	9 lengths, 18 in. to 53 in.	10.4 to 84	Special sizes, and types, on order	Convectofin	Commodore Heaters Corporation
4 depths, 3⅜ in. to 10⅝ in.	8 lengths, 18 in. to 60 in.	10.2 to 142.2		Dunham	C. A. Dunham Company
5 depths, 3 9/16 in. to 11⅛ in.	11 lengths, 14 in. to 64 in.	7.2 to 140.5	Maker also offers a bathroom convector and a humidifying convector. Latter in either recessed cabinet, or below-the-floor type	Chase-Erskine	Erskine Radiator Division, Chase Brass & Copper Co., Inc.
4 depths, 4 in. to 12 in.	25 lengths, 18 in. to 66 in.	9 to 120		Fintube	Fintube Radiator Company, Inc.
4 depths, 3½ in. to 10⅝ in.		8.5 to 127.5		Chaud	Freed Water Heater Company
3 in., 5 in., and 7 in.		8 to 83.6		International	Governale Brothers, Inc.
5 depths, 3⅝ in. to 7½ in.	8 lengths, 15 in. to 50 in.	10.9 to 76.1		Herman Nelson Invisible Radiator	The Herman Nelson Corporation
In four sizes, 1, 2, 3, and 4 tube	—		A distinctive unit in that the element replaces the riser. Element forms shallow V to take up expansion. Suitable for combination heating and cooling	Ilg-Columnar	Ilg Electric Ventilating Company
4 depths, 3⅝ in. to 11¼ in.	12 lengths, 15 in. to 70 in.	11 to 197.6	Humidifying pan optional. Maker also offers bathroom convector	McQuay	McQuay Incorporated
4 depths, 3½ in. to 11½ in.	14 in. to 62 in.	6.5 to 200	Tubes staggered in elevation to facilitate draining and venting	Modine	Modine Mfg. Company
2 depths, 6 1/16 in. and 8 1/16 in.	In multiples of 2½ in. from 10 in.	9.8 to 91.5	A distinctive combination. Tubes extend crosswise of extruded surface in a U joining the cast-iron front at both ends	Copper-Cast	
3½ in., 4 in., 5½ in., 7½ in., and 9 in.	By 2 in. increments from 10 in. to 100 in.	4.7 to 239. Large capacities are for multiple tiers	Elements are installed in multiple arrangement side by side. Assembly can also be installed in tiers—one above the other	Aero Convector	National Radiator Corporation

REFERENCE LIST—

TYPE (Letters Refer to Types Illustrated elsewhere in this article)	CONSTRUCTION OF ELEMENTS		ENCLOSURES		
	TUBES OR CHAMBER	EXTENDED SURFACE	TYPE OF FRONT	TYPES AVAILABLE	STACK HEIGHTS
A—with supporting sides on fins. Multiple arrangement of this type	Copper tubes	Corrugated copper	Panel or plastered-in	Concealed, partially concealed, wall hung, and cabinets	Cabinet heights from 18 to 40 in. by 2 in. increments
F3—a combination convector and radiator	Cast-iron chamber	Cast-iron integral with chamber	Front integral with unit	Unit acts as its own enclosure	15½ in.
A—with multiple tubes	Copper tubes	Copper, corrugated	Panel or plastered-in	Concealed or cabinet	Enclosure heights—20 in , 23 in., 26 in.
D—with chamber all part of a common core	Brass	Copper sheets folded to form flues	Panel	Concealed or cabinet	11 enclosure heights, from 16 in. to 120 in.
F2—a combination radiator and convector	Copper tube	Steel—entire radiator is extended surface in contact with internal tube	Metal enclosure forms flues and acts as both extended surface and enclosure	Front or top grille in cabinets, or recessed with exposed front	Radiator heights from 14 in. to 23 in.
C—	Cast aluminum, elliptical chamber	Cast aluminum, integral with chamber	Panel or plastered-in	Concealed	12 heights, from 20 in. to 70 in.
A—with multiple tubes	Copper tubes	Copper	Panel or plastered-in	Concealed, semi-recessed, or cabinets	9 heights, from 12 in. to 32 in. Enclosure heights 6 in. greater than stack heights, excepting wall hung cabinets
A—with multiple tubes	Copper tubes	Copper	Panel or plastered-in	Concealed or cabinets	12 heights, 12 in. to 50 in. Others to order
A—with multiple tubes	Copper tubes	Copper	Panel or plastered-in	Concealed or cabinets	20¼ in., 24¼ in., and 30¼ in.
C—in single or multiple arrangements of this general type with side walls integral with fins	Cast-iron chamber	Cast-iron, integral with chamber	Panel or plastered-in	Concealed or cabinets	From 14 in. to 60 in.
C—in single or multiple arrangement of this general type but fins extend out at top and bottom as well as sides, and are wider spaced than drawing indicates, and also much more shallow	Cast-iron chambers	Cast-iron, integral with chamber	Panel or plastered-in	Concealed. Elements may be used free standing if desired, giving a combination radiator-convector	14 heights, from 13 in. to 60 in.
B—multiple arrangement of this type	Cast-iron (or aluminum) tubes	Cast-iron (or aluminum) integral with tubes	Panel	Concealed or cabinets	9 heights, 12 in. to 72 in.
A—multiple tube arrangement of this type placed at an angle to air flow	Copper tubes	Aluminum	Metal panel, or arranged for concealment within all types of wall surfaces	Concealed, panel-front or cabinets	18 in. to 80 in.
F1—combination radiator and convector	Cast-iron chamber	Cast-iron, integral with chamber	Cast-iron tubes act as front	Cast iron front with sheet-iron top	20½ in., 23½ in., 26½ in., 29½ in.
A—multiple arrangement of this type	Copper tubes	Copper	Panel or plastered-in	Recessed, semi-recessed, or cabinets	20 in. to 50 in.

GRAVITY CONVECTORS

SIZE OF ELEMENTS		CAPACITIES, SQ. FT. STEAM E.D. RADIATOR	REMARKS	TRADE NAME	MANUFACTURER
DEPTH	LENGTH				
5 depths, 3⅝ in. to 14⅛ in.	10 lengths, 14 in. to 60 in.	6½ to 170	Features include supporting sides on fins and different types of header castings	Perfex	Perfex Corporation
5 in., 7½ in.	By 2 in. increments from 8 in. to 66 in.	8.6 to 107.25	An arrangement of cast-iron sections with extended surface forming flues	Richvar	Richmond Radiator Company
5 depths, 3½ in. to 11½ in.	11 lengths, 18 in. to 72 in.	10¼ to 80½ for heights to 26 in. and depths to 7¾ in.	Maker also offers Rocop bathroom unit and Revere-Rocop humidifier	Rocop	Rome Radiation Division, Revere Copper & Brass Co., Inc.
5 depths, from 3½ in. to 11½ in.	9 lengths, 18 in. to 70 in.	10½ to 220	Maker also offers Robras bathroom units	Robras	
3 in.	From 11 in. to 71 in.	From 3.4 to 60.4	For high or low pressure steam or water. Maker also offers a "High Convection" radiator, resembling pipe coils	Shaw	Shaw-Perkins Manufacturing Company
4⅜ in. 8 in.	6 lengths, 12 5/16 in. to 61 11/16 in.	7.3 to 35.4		Thermal Units	Thermal Units Mfg. Company
5 depths, 3⅜ in. to 14⅝ in.	10 lengths, 14 in. to 60 in.	6.5 to 160	Maker also offers a humidifying convector and bathroom convector	Trane	The Trane Company
4 depths, 3¾ in. to 9¾ in.	18 lengths, 18 in. to 60 in. Others to order	10.6 to 128	Maker also offers a bathroom convector	Kramer	Trenton Radiator Works
6 depths, 3½ in. to 12 in.	20 lengths, 14¼ in. to 60 in.	9 to 141.9	Maker also offers a humidifying convector in semi-recessed or cabinet type; also a bathroom convector	H-C-H	Tuttle & Bailey, Inc.
4 depths, 3½ in. to 10⅝ in.	Wide range	10.2 to 153.0	Humidifying pan optional with certain types of enclosures	Fincast	United States Radiator Corporation
4 depths, 1⅝ in. to 7¼ in.	See remarks	7.7 to 73.9	Assembled in sections in a manner similar to tubular cast radiators, each section being 10, 15 or 20 in. long	Capitol Concealed	
—	13 lengths, 15 in. to 75 in.	7.7 to 18.7, depending on number of tubes		Grid	The Unit Heater and Cooler Company
3½ in. 4⅞ in. 7½ in.	8 lengths, 18 in. to 54 in.	10.2 to 135	Built in inlet valve, trap and unions permit concealment and removal of element without injury to wall finish	Webster System Radiation	Warren Webster & Company
Recess 4⅛ in., recess 8 in.	In 4¾ in. increments from 19 in. to 96 in.	8 to 115	Distinctive in design. "Vectants" or panels can be assembled in multiple giving high capacity	Raydiant	Weil-McLain Company
3½ in., 5¼ in., and combinations of these	15 in. up in increments of 2½ in. to 62½ in.	10 to 144	Maker also offers a bathroom convector. Will soon have humidifying convector available	Young	Young Radiator Company

Design and Location of Registers and Grilles

By WALTER J. OTTINGER†

Of recent years, fabricated grilles and registers of the utmost simplicity have been coming into general use. Until recently, registers were designed to conform to the maker's conception of beauty or the convenience of the foundryman or punch press operator, almost with no regard to the behavior of air currents which they are supposed to control. It is only in the very recent past that they have begun to be considered specifically as devices for the efficient distribution of heated or cooled air, and their design has been studied with these requirements in mind. As a result of research, accident, and public demand, the newer standard grilles and registers are distinctly lighter, simpler, and more effective than were their predecessors.

One of the leading engineers and manufacturers has set forth the requirements in grille and register design in substantially the following fashion: (1) grilles and registers must be as nearly invisible as possible; (2) should mask the stack head or cabinet chamber when the dampers are in the open position; (3) offer the least air resistance at low, as well as high air velocities; (4) should create no air sound, and (5) air should leave in a diffused form. He further feels that when a horizontal duct is used, air should be delivered in a uniform flow to eliminate the use of air deflector blades in the duct. As a mechanical requirement the grille and register should be so designed as to prevent the entrance of foreign objects into the duct.

While this is a good statement, I have preferred to set up the essentials in a slightly different form and to regard them as four in number, thus: (1) due consideration for low air resistance; (2) minimum turbulence; (3) controls to prevent drafts, short-circuiting, etc., and (4) scientific sizing. We will take these up in order.

Inasmuch as the power cost of moving air increases greatly with the pressure required to overcome friction, it is important to keep resistance at a minimum. Digressing for a moment, this fact is largely responsible for the great improvement to be found in duct design. It seems entirely reasonable to ask, "Why bother to reduce friction in the ducts, only to increase the friction at the outlets by the use of flat head-on surfaces?"

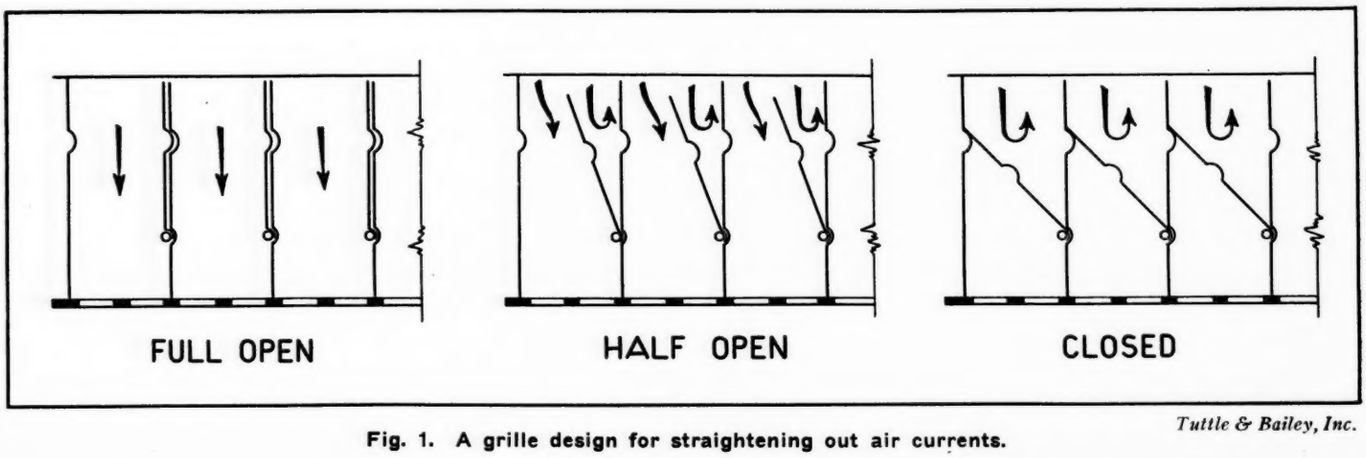
As it is not practicable to shape narrow bars into true air stream form, the minimum of air resistance is obtained by making the bars as narrow as possible. Close spacing is desirable for uniform distribution of air, mechanical strength, good appearance (particularly masking or hiding of the sheet metal work of the duct) and safety, indicating more difficult and costly stamping and forming practice.

The principal source of air whistle, rumbling, and other objectionable air noises, is in the turbulence or eddy currents formed by the moving air, when it encounters obstructions. The disease and its cause being known, the method of prevention is not difficult. All objectionable air noises will be eliminated to the extent that flat head-on surfaces and other obstructions are removed, keeping air resistance at the absolute minimum.

Controlling the movement of air is a difficult matter. There are many patents on air controlling devices and a wide divergence of opinion as to their merits. We are here concerned only with valves or louvers attached to the outlet face, which differentiate an air register from a grille according to the generally accepted definition.

Whether the single louver valve be attached to the frame or to the register face depends principally upon the construction of the registers under consideration. I can see advantages and disadvantages on both sides, but the point is a minor one and will prove of little concern to the owner who, after all, is the court of last resort. Other things being equal, I personally prefer having the damper attached to the register face, especially on wall-type installations, rather than to the frame. This eliminates the possibility of damper or

†Mechanical Engineer, Cleveland.



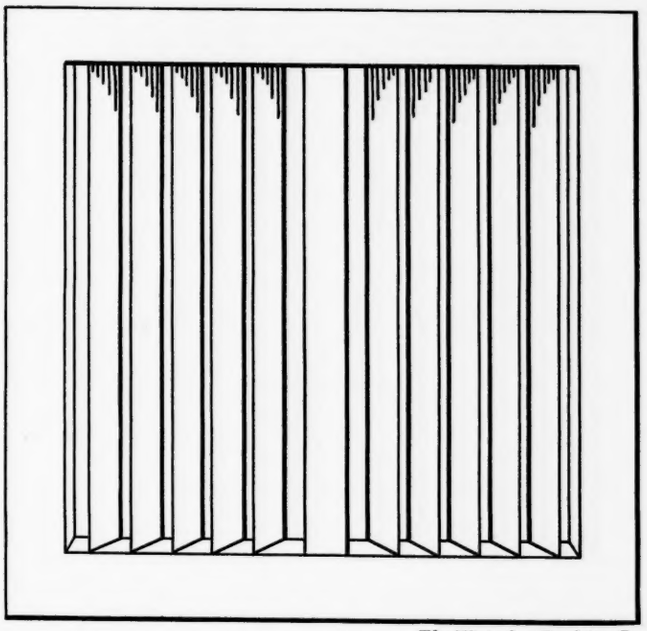
Tuttle & Bailey, Inc.

Fig. 1. A grille design for straightening out air currents.

hinge being damaged from plaster or water, or even collision, during construction of the building.

An ingenious device for straightening out air currents at all valve openings is shown in Fig. 1. In order to secure the full benefit of the valve design, it should be used in connection with an efficient face design, to prevent eddy currents at the face or grille.

Desirable methods of attaching the register frame to the duct must result in tight joints and prevent dust streaks. Most progressive manufacturers have these features well worked out to the satisfaction of contractor and owner.



The Waterloo Register Co.

Fig. 2. A multi-louver register which omits grille work.

I am puzzled as to what to say about scientific sizing of registers and grilles. If jobs of this kind were always handled by engineers trained in this type of work and with the necessary equipment of instruments for testing capacities, I would have no hesitation in recommending that registers be rated according to their capacity in cubic feet per minute for air at definite velocities and definite temperatures. There should also be a slight correction for moisture content of the air. But until such training and facilities are generally available for testing and checking ratings such as the foregoing, it is useless to recommend the method. Unquestionably, it is desirable as an aim, but at present must remain as an ultimate and desirable goal rather than an actual present standard.

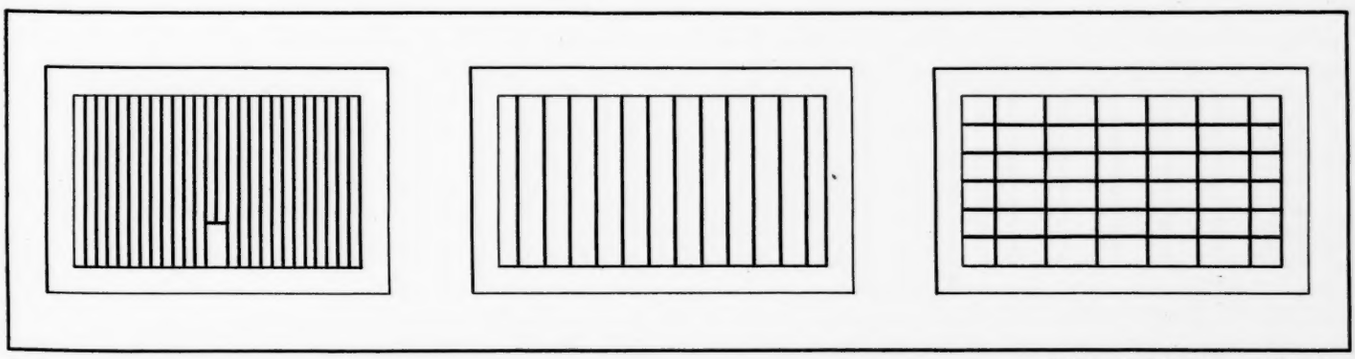
If manufacturers, architects, and contractors are agreed on a definition of free area, and due consideration is given to design for reduction of friction, there need be few mistakes made in the choice of grilles and registers for any given job. All reputable manufacturers publish ratings of their products to assist engineers and contractors in selecting correct sizes, so that owners may be assured satisfactory results.

Air has a persistent tendency to stratify, the warmer air forming an upper dead hot layer with successively cooler layers toward the floor. The most effective method of preventing air stratification is to keep it in motion, and the positive circulation provided by a fan or blower is the surest method of providing even, comfortable flow of air. As air is heated it expands and, becoming lighter (per unit of volume) tends to rise and diffuse, whereas air when cooled has the opposite behavior. A brief consideration of these simple, fundamental facts, reveals the advantage, almost the necessity, of providing positive air circulation. Velocity and direction of air flow have great influence on its diffusion.

Considerable experimenting is being done with location of both registers and grilles with and without consideration of the same outlets for summer ventilation and cooling. Successful installations have been made with both inlet and outlet openings on the same walls, in some cases the inside, in others the outside wall. Fortunately, the departures from conventional locations are usually in the hands of the most capable experimenters, so much good work is being done and valuable information is being collected.

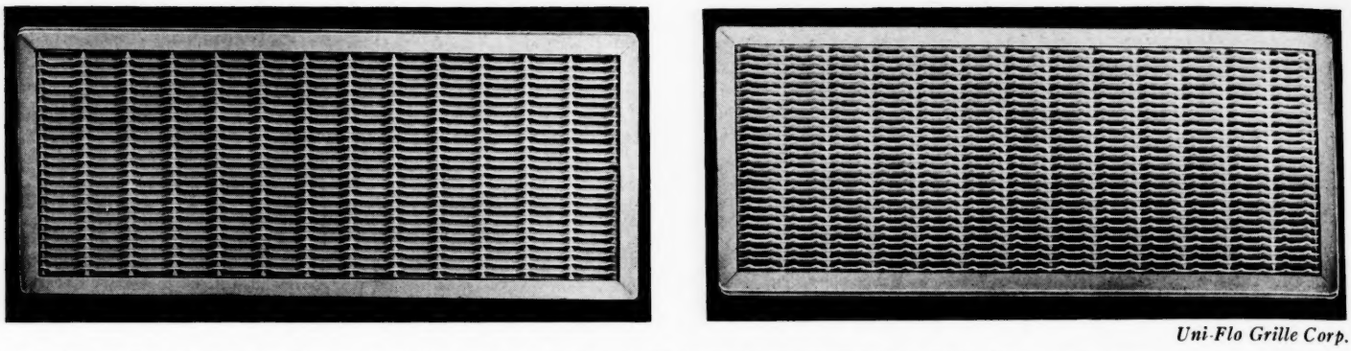
In the catalogs of progressive register manufacturers a distinct trend can be noted toward simple, effective designs, tending toward less height and greater width. This is a contribution toward improved appearance as well as better performance. Mention of three outstanding types of grilles and registers will be of interest.

Fig. 2 illustrates an outstanding departure from the older conventional design, the omission of grille work of any kind, the twin sets of multi-louvers controlling the air supply at the face of the register. An interesting feature is that at any position of the louvers, except wide open, higher air velocities automatically cause



Independent Register and Mfg. Co.

Fig. 3. Modern design of register using narrow steel strips, increasing the free area.



Uni-Flo Grille Corp.

Fig. 4. Two different designs of grilles using strips of sheet metal separated by wire bars. The fins are so shaped that they act as guides to the air.

more thorough diffusion. An ingenious locking attachment prevents vibration of the diffuser louvers in any position. The same principle is also used where louvers are hinged horizontally.

Fig. 3 illustrates a modern design using narrow steel strips set on edge instead of the more conventional square mesh pattern. This permits the open area to be increased for the same center-to-center spacing. The bars have a thickness of 0.078 in. by a depth of ½ in. Grille openings may vary from ⅜ in. to ¾ in. The figure shows how spacing between bars may be varied.

Fig. 4 shows a design in which thin strips of hard rolled steel are used as fins. These are supported by flat steel wire bars, and all are assembled into frames. The fins can be so shaped that they act as directors or guides, and it is possible to arrange them so that the air stream is directed in more than one direction from the same grille.

Community Smoke Abatement Plan Would Help Air Conditioning Industry

SPEAKING before a meeting of the Section on Public Health and Industrial Medicine of the College of Physicians of Philadelphia, H. B. Meller, in charge of air pollution investigations, Mellon Institute of Industrial Research, Pittsburgh, stated that the role of leadership in the campaign against air pollution belongs to the medical profession, and points out that urban dwellers have a right, as a matter of public health, to expect the standard of air purity to be brought up to that now established for water and food. Mr. Meller believes that current conditions are favorable for campaign success, and that a workable plan would result in helping industries such as air conditioning, assisting in restoring real estate values, and in relieving unemployment.

Smoke-regulating ordinances now in effect in the majority of American cities are necessarily compromises, with the limitations on smoke emission made in the light of combustion practice in vogue at the time of their passage and with regard to equipment designed without any definite restrictions. Plant owners feared unreasonable restrictions through unintelligent and unsympathetic enforcement, and homeowners failed to take kindly to regulation, although often eager to have industrial and commercial plants regulated. Further failure of the ordinances to effectively curtail the smoke nuisance is attributed to inadequate enforcement machinery, coupled with a lack of intensive public support.

With respect to stricter regulation, Mr. Meller stated that equipment is now available to satisfy much more stringent regulations than those at present in effect with indifferent success. However, the first step in the campaign should be the organization of an air hygiene district to include all parts in the smoke area, and the formation of an air hygiene commission, the membership of which should include representation from the medical, chemical, engineering, and architectural professions, and the financial, manufacturing, commercial, and real estate groups. A survey of atmospheric pollution should then be conducted, to determine the nature and extent of the pollution, and its sources and causes.

A survey should also be made of present fuel-burning equipment in operation in the locality with reference to its obsolescence, state of repair, method of firing, and fuel used. A comparative study should be made of fuels and equipment obtainable on the local market, with a view to determining the possibilities obtainable in efficiency, economy, and cleanliness.

Then, with this information at hand, the commission will be prepared to submit recommendations for legislative enactment, incorporating standards to be met in the district through alterations and repairs, new equipment, and by other equipment currently serviceable.

Modern Dallas Buildings Heated and Conditioned by Gas

Mechanical equipment installations in two outstanding Texas buildings—the Adolphus Hotel and the Dallas Gas Company Building

By J. B. NEALEY†

A LARGE number of those who go South for the winter are not content to return to the same place year after year, but are continually seeking new fields. During the past few years, there has been a trend of tourists going to Dallas, Tex., for winter residence. This beautiful city has climatic conditions and scenic attractions equal to any in the Southwest.

Adolphus Hotel

The Adolphus Hotel in this city, built by Adolphus Busch of the Anheuser-Busch interests, is in the enviable position of having no indebtedness and at the same time enjoys an income that permits of a continuous program of redecorating and refurnishing. This program is being carried on throughout the entire structure, two floors at a time, and between $300,000 and $400,000 will have been expended by the end of the current year.

The original building, a 23-story structure, was completed in 1912. The second building, 12 stories, went up in 1916 and the ever-expanding business necessitated the erection of a 25-story building, completed in 1926.

The Adolphus has more public dining rooms and greater convention facilities than any other hotel in the Southwest. There are six large dining rooms and many smaller ones that require the facilities of six kitchens. On the ground floor is the main dining room, the Junior ballroom, and the coffee shop, while on the roof is the roof garden. The Palm Garden is on the 21st floor while the English room is located on the mezzanine. In addition there are six smaller dining rooms on the mezzanine that will accommodate from 15 to 150 people. There are also a number of other private rooms with individualistic interior decorating and known as the Gold, Danish, and Yellow rooms, the Bridge, etc.

All of the heat, light, and power consumed in this hotel is produced on the premises by the use of gas fuel. This is accomplished with three 500-hp. steam boilers. Formerly fired with coal, they were converted to gas fuel some 10 years ago by equipping each with three gas burners. The steam is utilized in steam engines direct connected to as many electric generators of the following capacities: two 300 kw., two 250 kw. and one of 150 kw.

Exhaust steam from the engines is employed in three ways: (1) heating the building; (2) water heating, and (3) process heating such as laundry, valet, kitchens, etc. The heating systems consist of steam radiators fed by steam pipes rising to the roofs and a vacuum return with re-use of the condensate in the boilers. Hot water is distributed by running a pipe line to the roof of the building and letting it feed to the various floors through a return pipe. Continuous circulation is maintained by motor-driven pumps.

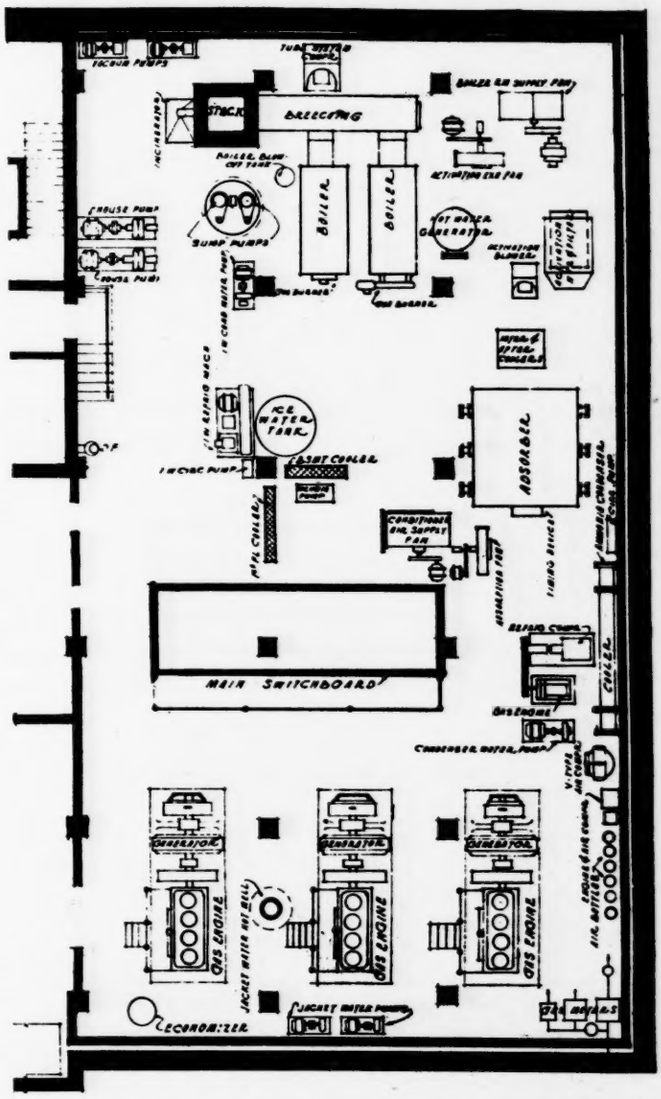


Fig. 1. Plan of the machinery room of the Dallas Gas Company Building. Lang & Witchell were the architects, and Charles L. Kribs, Jr., the mechanical engineer

†American Gas Association.

BUILDINGS IN SOUTHWEST HEATED BY GAS

The two views below of the Adolphus Hotel, Dallas—a 23-story building with three 500-hp. gas-fired boilers supplying the heat, light and power plant. The views on the opposite page are of the 13-story Dallas Gas Company Building, for which gas furnishes the energy for heat, power, light, refrigeration and air conditioning.

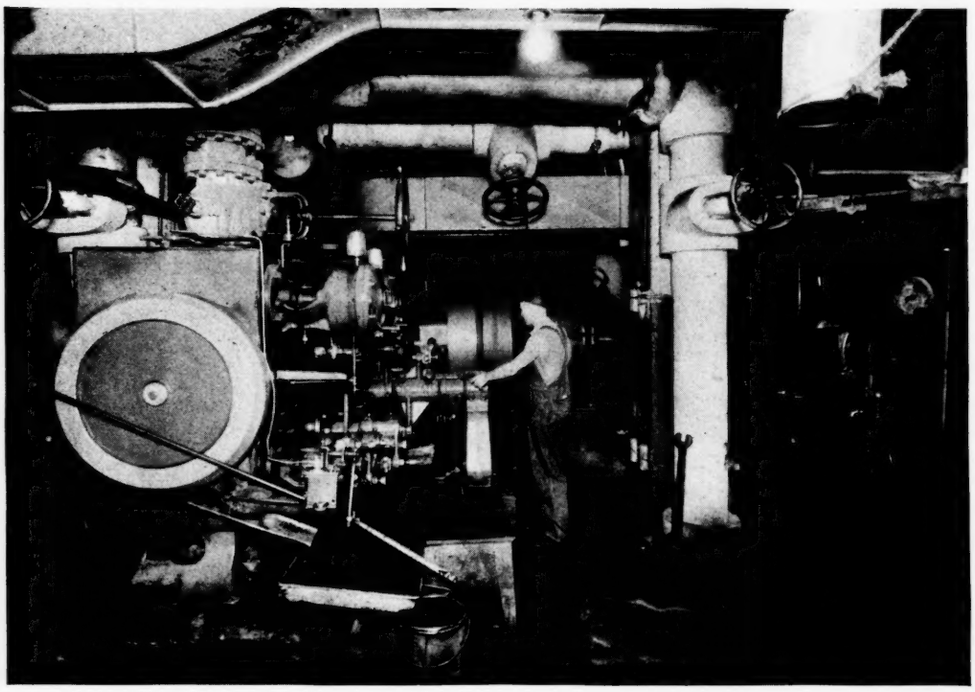


Fig. 2. Steam engines and turbines drive two 300, two 250, and one 150 kw. generators in the Adolphus Hotel.

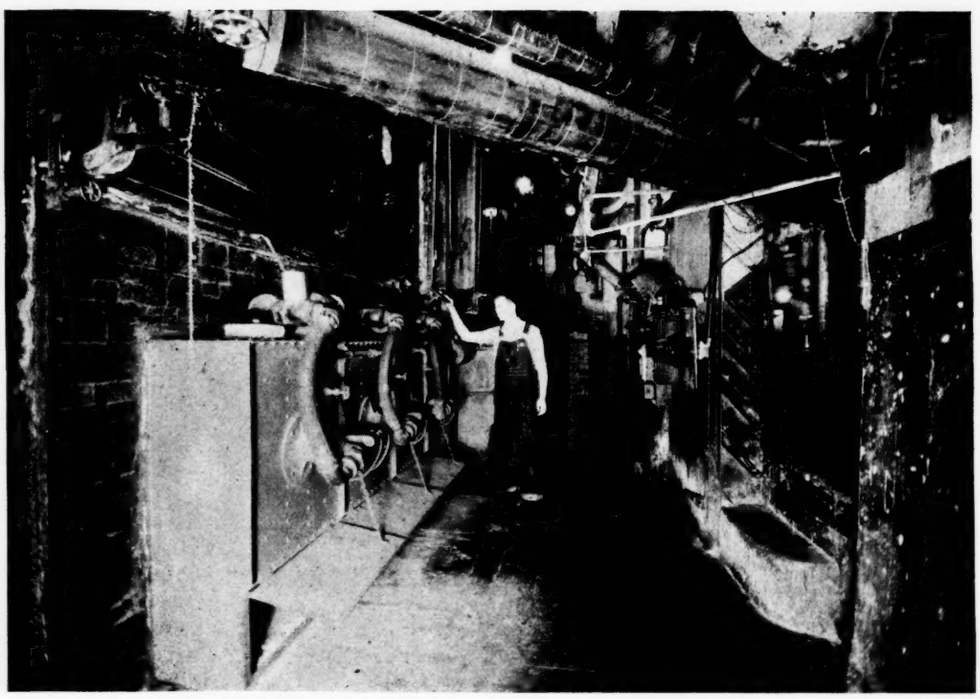


Fig. 3. Gas-fired steam boilers in the Adolphus Hotel. Gas is also used in the kitchens for baking and cooking.

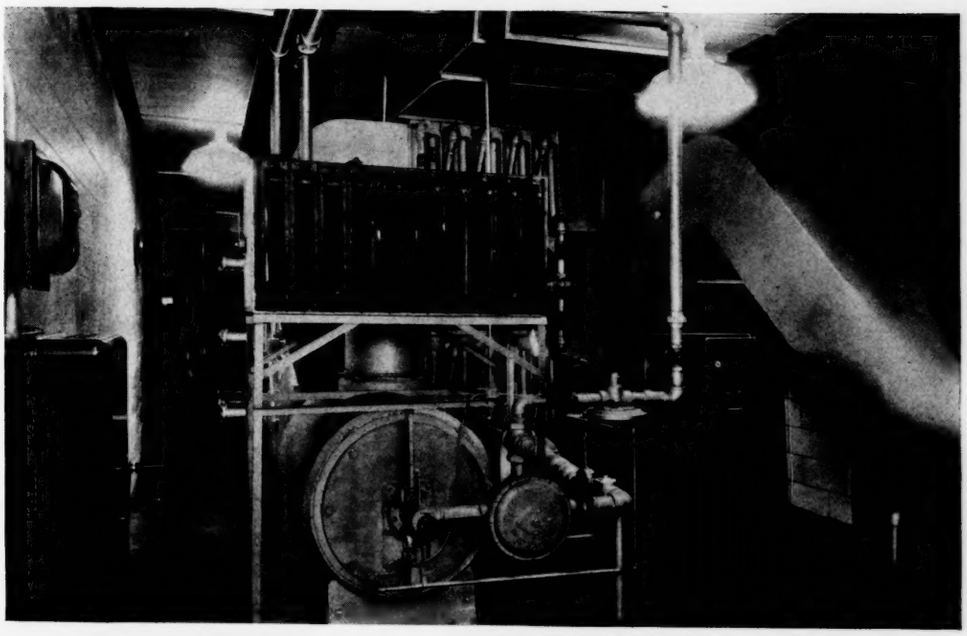


Fig. 4. Gas-fired activation unit, part of the silica-gel air conditioning system in the Dallas Gas Company Building.

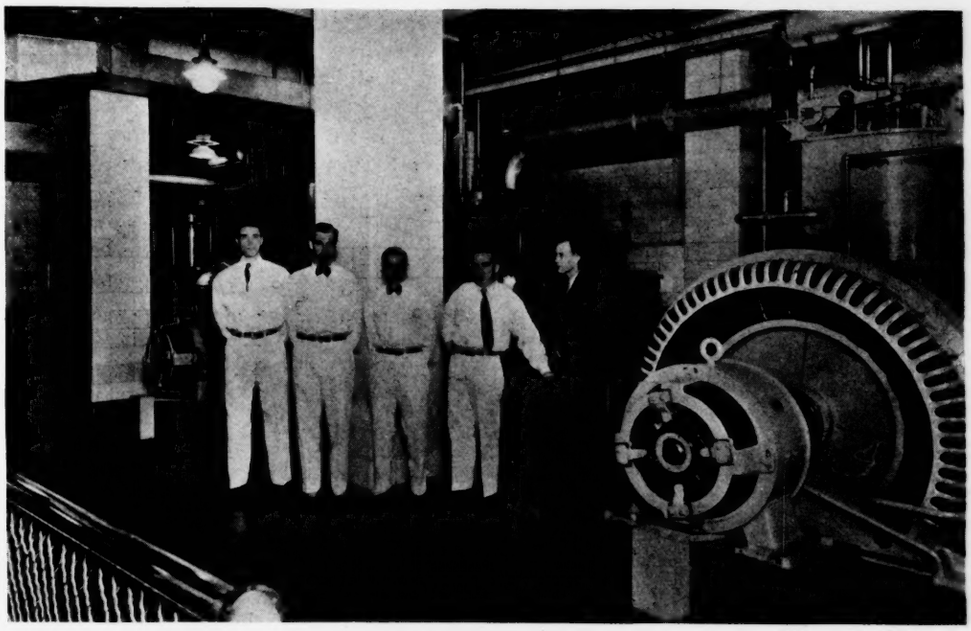


Fig. 5. Engine room operating department, Dallas Gas Company: Left to right, J. C. Manning, Jr., G. H. Capps, O. G. Stuart, W. F. Gieb, and J. F. Jones, chief engineer.

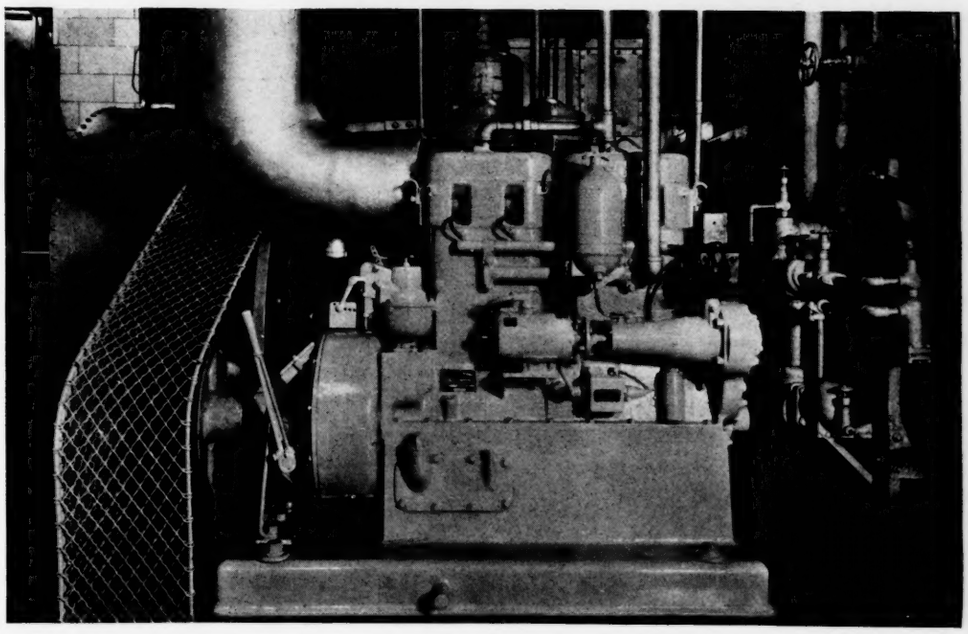


Fig. 6. Fifty horsepower gas engine driving ammonia compressor, part of the air conditioning equipment in the Dallas Gas Building.

Electricity generated on the premises is employed for lighting and in operating motors for fans, elevators, machine shop, pumps, kitchen, laundry, refrigeration, for iced air for the coffee shop, barber shop, engineer's office, etc. In this connection there are a total of 22 electric elevators and five hydraulic elevators. For refrigeration there are three machines, motor-driven, with a combined capacity of 95 tons, and a steam-engine-driven refrigerating machine of 75 tons. Much of this power and steam is sold outside.

The hotel owns its own wells, which are on the premises, and for lifting and distributing this water five motor-driven and one steam-engine-driven pumps are required. Gas is used throughout in the six kitchens, in the ranges, broilers, toasters, coffee urns, hot plates, griddles, etc. The ovens in the bake shop are also fired with gas with the exception of one electric oven. Baking is quite an item here for it includes not only the famous Adolphus buns and fruit cake but also more than 3600 loaves of bread every day.

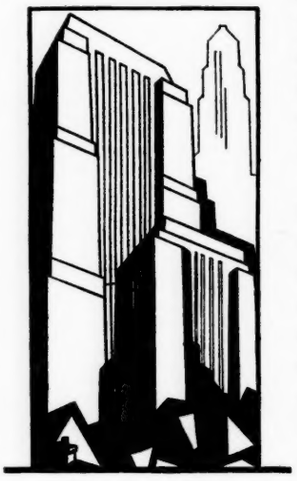
Dallas Gas Company Building

An innovation in modern architecture is that of a huge office building with no electric wires running into it, although it uses as much electricity as any other office building of the same size. In the place of the usual electric wires is substituted a pipe line transmitting gas. Such a building is the new 13-story office building of the Dallas Gas Company, which covers half a city block and will eventually rise to 22 stories.

Gas supplies heat, light, power, refrigeration, air conditioning, etc., and is also employed as the culinary fuel in the restaurant. Furthermore, these services are extended to the 10-story building next door. Electric power is generated by three synchronous generators direct connected to three gas engines of 165 hp. each. These engines are of the heavy duty, four cylinder type, similar in operation to the common automobile engine except that they are many times larger, operate at slow speed (277 r.p.m.) and utilize gas instead of gasoline. The electric current generated is 220 volts, 60 cycle, three phase, a.c., with a fourth wire neutral take-off to provide a lighting current without the use of a transformer.

The hot products of combustion from these three engines are used in a heat exchanger of the tubular type to heat water, which in turn is used in the wash rooms throughout the building. Only two of these engines are ordinarily employed, the other being kept as a standby unit. Refrigeration is accomplished with an ammonia compressor, direct connected to a 40-hp. gas engine operating at 900 r.p.m. These engines are all water-cooled and motor-driven pumps circulate this water through cooling towers.

Electricity is employed in the ordinary uses throughout the building as for lighting and operating motors, for the elevators, pumps, laundry, kitchen, machine shop, fans, etc.



Steam for heating the building is low pressure and supplied by two horizontal tubular type boilers, fired with gas burners. These boilers are continuous and automatic in operation, requiring no attention whatever. The correct steam pressure is mechanically maintained by means of a small steam pipe running from the boiler to the upper side of a diaphragm. The lower portion of this diaphragm is connected by a stem to a valve in the gas supply line to the burners and this is kept in the open position by a spring. When the steam pressure rises above that set on the control, it forces the diaphragm and valve stem down, causing the valve to shut off the gas flow. Conversely, when the pressure drops, through lack of combustion in the firebox, the spring forces the diaphragm and valve up, thus restoring the fuel flow. This same diaphragm causes the dampers to the air intakes of the furnace and burner to open and shut, synchronously with the gas valve.

Pressure regulation of the other boiler employs the same kind of diaphragm but utilizes butterfly valves in the gas supply line to the burner. These valves are automatically opened and closed by means of chains connecting them with the diaphragm.

A single master control automatically maintains the desired temperature throughout the building by means of a master radiator equipped with thermostat, mercoid switches, etc., by which the volume of steam to the entire radiation system is regulated.

Making weather by cooling and dehydrating air is a proposition that is attracting the attention of engineers and architects all over the country. This installation removes the moisture from the hot, humid air, blends it with untreated air to give it the proper amount of humidity, and then cools it for circulation in the first floor lobby and basement sales floor.

Dehydration is accomplished in a unit consisting of three beds of the adsorptive material, silica-gel. The air is first filtered and is then blown through these beds, one at a time, where the moisture is extracted. It leaves the beds at temperatures in the neighborhood of 115° and in each case is cooled by allowing it to flow through coils circulating water that has been cooled in the towers on the roof. These are known as the intercooler and aftercooler. The adsorption beds are dried out or activated by forcing hot air through them. This air is heated in a gas-fired heater to 350°, the heater being constructed of sheet steel and well insulated.

This process is on a progressive time cycle in which two of the beds act as adsorbers while the third is being activated. After a time interval of 40 min., the dampers in the air delivery ducts are automatically reversed so that one of the beds, that has been collecting moisture, is activated in turn, and so on. The hot air employed in activation picks up the moisture from the adsorptive material and is vented to the atmosphere.

Design and Installation of Instrument Boards

Part 2—Conclusion

By JOHN A. MASEK

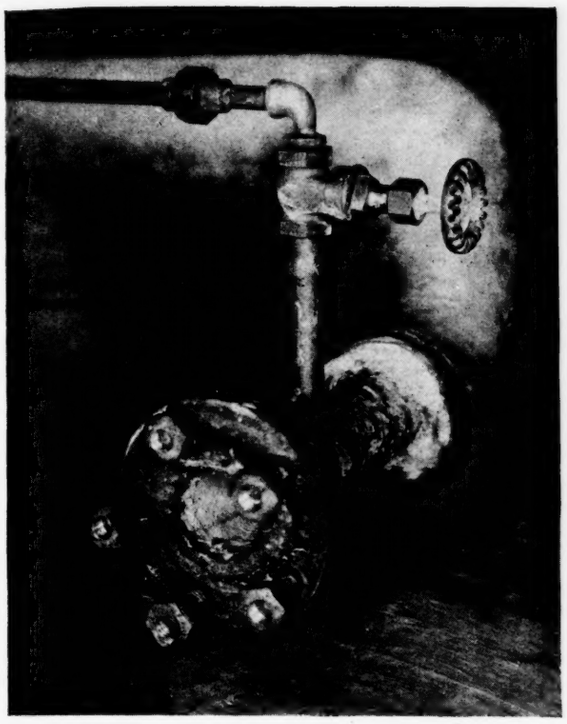


Fig. 22. Gauge piping should be connected to the top of mains. The connecting nipple should either be welded to the main or the main drilled and tapped. A shut-off valve near the main aids in cleaning the pipe.

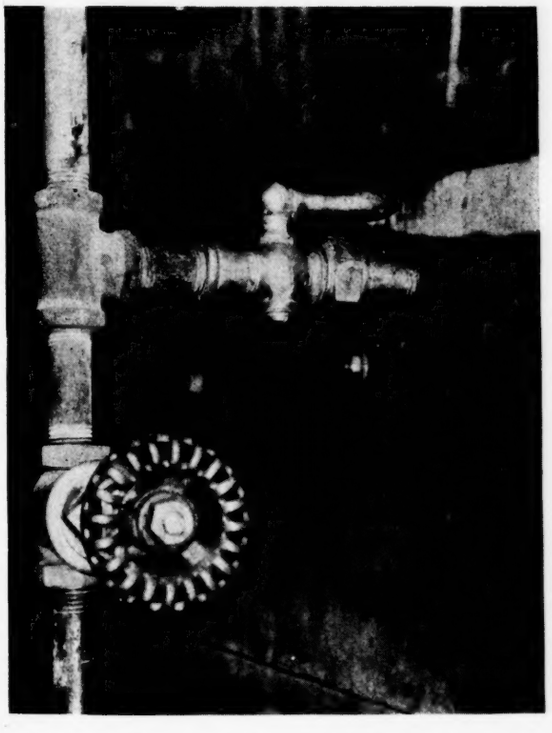


Fig. 23. Piping back of a gauge board should include a valve at the gauge and also a drain valve at the end of the line.

Gauge Pipe Lines

PIPE lines leading to gauges and instruments should be installed with caution so there are no pockets or traps to hinder or reduce the actual pressure that is to be measured at the gauge. Most gauges are furnished with ¼-in. male pipe thread connection. The minimum iron pipe size for gauge lines of any great length should be ½ in., while in some cases ¾-in. pipe will be found to give better service.

Brass and copper piping is now frequently used for instrument piping. This is particularly true of copper tubing, coupled with special compression fittings, shown in Fig. 29. The fittings usually require that the ends be flared where the union connection is made. Soft annealed copper tubing has the advantage of being easier to install than rigid pipe. There is also an elimination of corrosion and less resistance to the flow. The tubing can be bent at corners and offsets made without using fittings.

Horizontal pipe lines will have no effect in the pressure readings, except that there will be a slight lag in the readings during the pressure changes. There is always an accumulation of sediment, corrosion that restricts the actual diameter of the pipe. A shut-off gate valve and union should be installed at the source of the line connection, to take care of future repairs, or facilitate in blowing out long pipes in the event they become clogged, as illustrated in Fig. 22. Dirt pockets are recommended, valved at the bottom and end of the line that leads to the gauge (see Fig. 23). Solid particles lodging in the Bourdon tube will ruin any gauge.

Before any instruments are connected to the pipe lines they should be thoroughly washed out, then blown through with compressed air. Where there are many pipe lines, the different lines should be laid out and fastened neatly in a row, as in Figs. 24 and 25.

Piping of steam gauges below the connecting outlet will affect the initial reading if corrections are not made. Condensate will accumulate in the vertical pipe. The pressure indicated will be that of the steam plus the weight of the head of water in the pipe. If the height of water column is known beforehand this information should be mentioned in the gauge order so that the manufacturer can calibrate the gauge with this correction. Gauges sent to manufacturers for repairs should likewise have this notation on the gauge so that the repair man can calibrate it accordingly.

This correction can be made on the job, where the engineer is familiar in testing and calibrating gauges, by taking off the gauge glass and removing the pointer with a hand jack. The puller will loosen the indicating pointer from the pinion. The pointer is then reset at zero when there is no internal steam pressure. A flat-head punch held over the

pinion shaft and tapped lightly with a hammer will fasten it firmly in place.

Gauges connected to water lines in which sudden or pulsating pressures prevail require special attention. Such fluctuations cause the indicating pointer to jump, resulting in parts wearing out sooner than necessary. The fluctuations can be dampened by throttling down the connecting gauge cock. The preferred method is to make an air cushion chamber from a piece of pipe 1 ft. or 2 ft. long and connect it near the gauge. This will usually absorb the pulsating pressures, making it easier to read the indications and prolongs the life of the gauge.

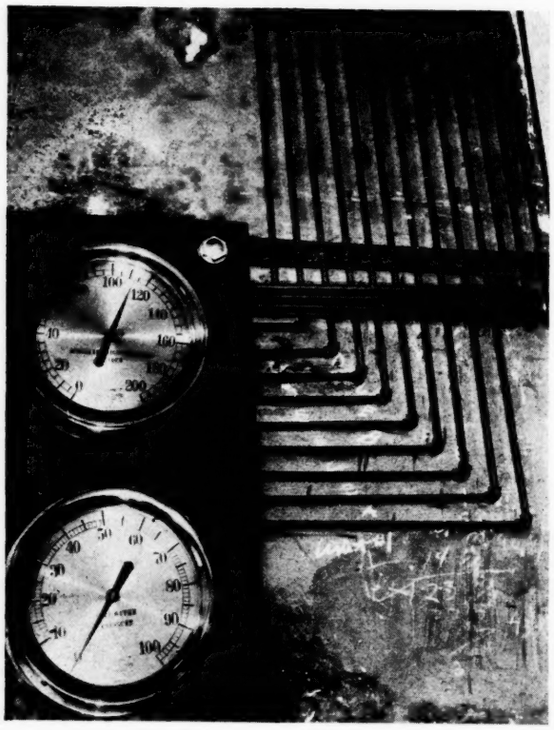


Fig. 24. Piping connections to the gauge board should be made in an orderly manner as illustrated.

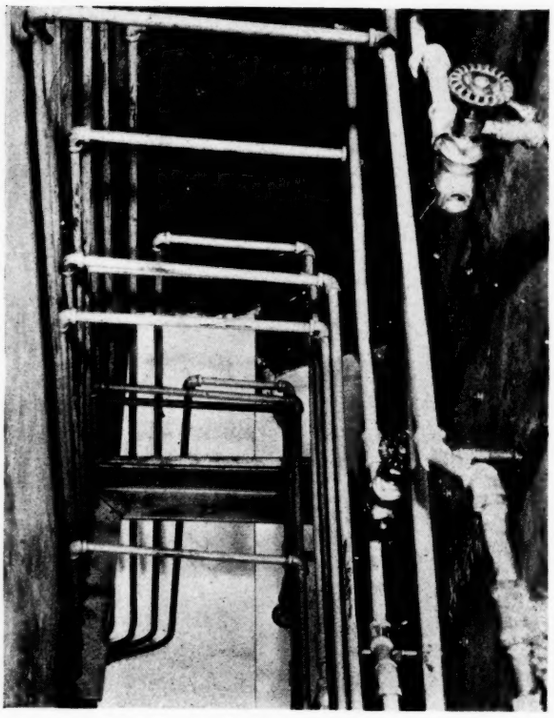


Fig. 25. An example of the piping arrangement in the back of a gauge board.

Gauge piping outlets should not be placed at the direct outlets of the boiler feed piping or tank discharge lines because the immediate velocity of the flow is greater at this point. The momentum of the flow will give an erroneous pressure reading. Boiler gauge connections should be made at the steam chamber. Gauge lines at the pumps should be connected near the air chamber, where the governor piping is made. Tanks should be provided with special gauge connection outlets.

When it is not advisable to have the accumulation of water in the gauge piping, as in the case with very low steam pressures to which a compound gauge may be connected, a thermostatic trap should be installed at the lowest point to carry away the condensate, as shown in Fig. 28. A siphon should always protect the gauge from live steam. If a siphon is not installed the Bourdon tube will be destroyed.

Since gauges have to be frequently tested, a practical idea is to install a plugged tee in the gauge line piping near the gauge. The gauge can then be tested without removing it from the panel.

Gauge Cocks and Valves

The gauge cocks ordinarily supplied by gauge manufacturers are usually of the conventional plug type. These were relied upon years ago but should now be supplanted with ¼-in. globe needle valves, preferably with one union outlet. These can be secured in a straight or angle pattern from any valve concern. Since they sell for about $1, they cost no more than the other type.

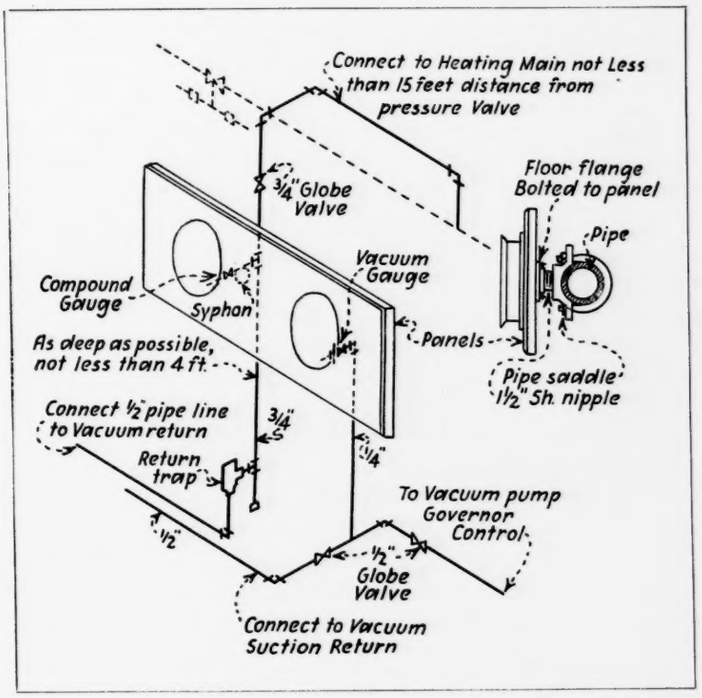
It is nothing unusual to look in back of a gauge board sometimes to see these plug cocks leaking. Wired cans have to be resorted to to catch the dripping water. They are often a source of much annoyance on this score. With the globe pattern recommended, the stuffing gland can be made tight and kept so.

All standard gauges are now made with a male screw connection. To use the conventional plug union gauge cock furnished with one female opening and a male connection on the union side, means either connecting the gauge with a coupling or if connected at the female opening will leave the pressure of the gauge line on the union side, see Fig. 26.

With the union globe needle pattern valve both of the openings are female, making it possible to make a better and neater appearing job by screwing the gauge in the union female opening. This leaves the valve on the pressure side as it should be when shut off. The gauge can be removed easily for testing. If the gauge tester is equipped with the same valve body, the gauge can be simply fastened at the union and removed after testing by loosening the gauge at the union connection.

Many an operator on acceptance of a new plant will take off all the plug gauge cocks and junk them, and replace them with the globe needle valves. When gauges with back connection are mounted on a panel the hole in the board should be drilled large enough to permit the union nut to pass through.

Fig. 28. (Right) Typical two-gauge panel for vacuum heating systems, with a suggested method for mounting small instrument panels.



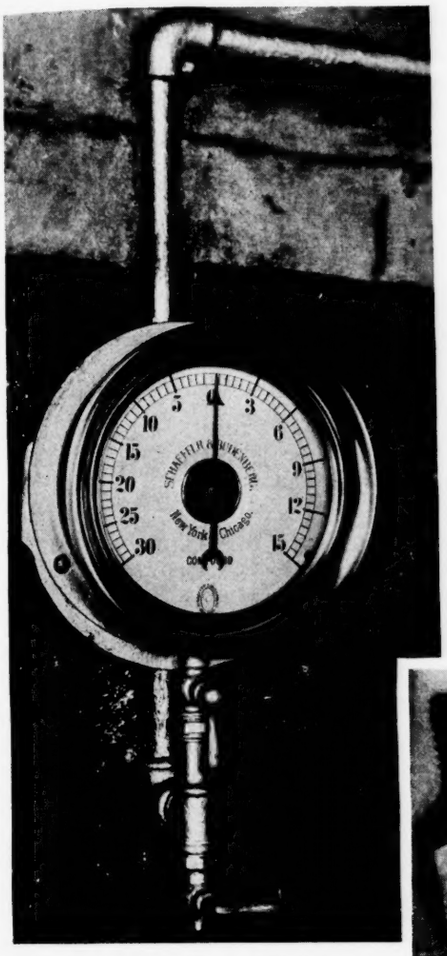


Fig. 26. (Above) Note that the union is on the pressure side of the gauge shut-off cock in this installation.

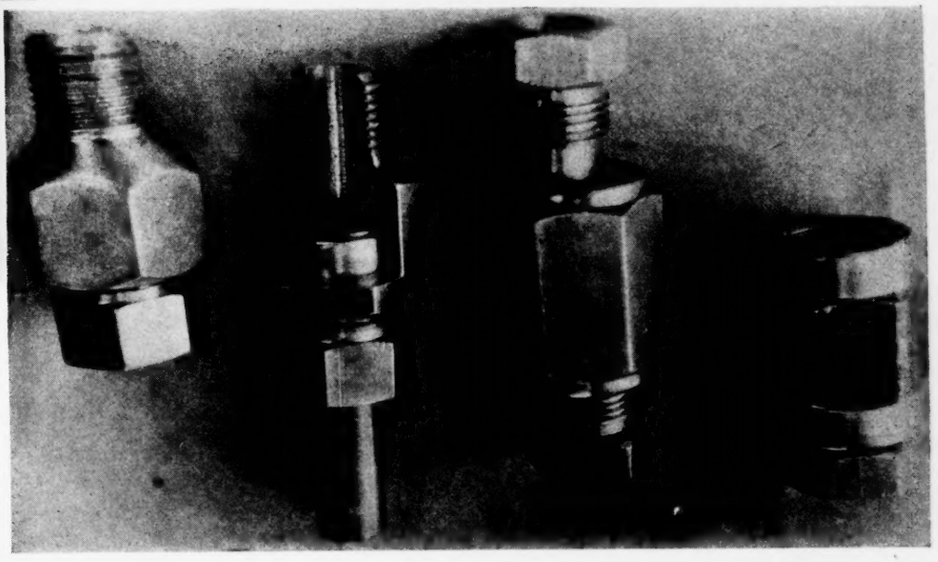


Fig. 29. (Right) Diaform fitting used in conjunction with copper tubing.

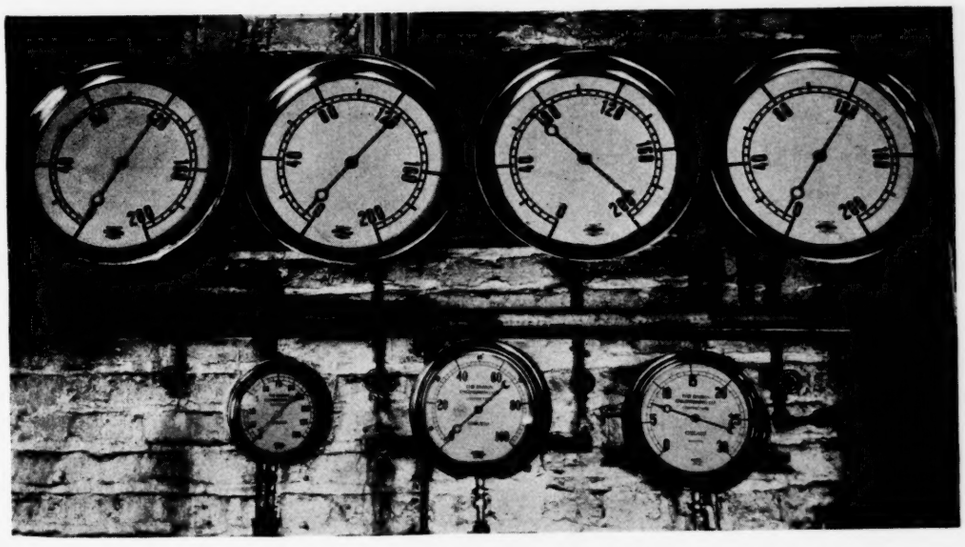


Fig. 27. (Left) Several of the gauges illustrated indicate a pressure, whereas no steam pressure exists. The dials were not reset to zero after installation and the gauges are indicating the pressure of the head of water in the column.

Small Motors for Air Conditioning Plants

By L. GWATHMEY† and B. S. WEAVER‡

WITH the growing interest in air conditioning and the wider variety of devices offered, the demand for small motors will be greatly increased. Motors to meet this demand will be judged largely upon the basis of dependability, quietness, and appearance.

A considerable amount of work has been done to improve the characteristics of motors for air conditioning use. Quiet magnetic structure, careful balance, and sound isolating bases may be considered as the outgrowth of air conditioning requirements. Additional improvements and development may be expected to meet the more exacting requirements of present day equipment and the demand of the new products that are rapidly appearing in the field.

General Considerations

The type of motor which may be used with air conditioning equipment is usually determined by the limitations of the available power supply and by the size of the equipment. Most of the electric utilities have established regulations governing the voltage and phase of the electrical service for equipments of various sizes, these regulations being intended to prevent mis-applications which would overload the circuits or interfere with the service to lighting and small appliance loads.

In general, motors up to about ½ hp. are allowed on 110-volt lines, larger sizes being operated from a 220-volt supply. Exceptions are sometimes made where it is not convenient to furnish energy at 220 volts.

Motors up to about 5 hp. are usually specified to be single phase, larger motors polyphase. This dividing line is as low as 2 hp. in some cities, and may be even lower where a large number of small motors are served through the same transformers, as in large office buildings. At the other extreme of sizes, the motors driving electric clocks, damper regulators, and similar devices with an input of only a few watts, are commonly designed for voltages below 25, and are operated from the 110-volt supply through transformers furnished with these devices. In general, domestic motor installations of approximately 1½ hp. or larger are at present the subject of special arrangement, since the starting inrush of a 1½ hp. motor may be from 5 kva. to 7 kva. The installation of large motors (1 hp. and above) in residences as required for house-cooling equipment is still so new a development that there are very few rules, based on experience, to regulate the allowable starting current. It is likely that the homes which first adopt this equipment will be those which already have a large electrical load including ranges, water heaters, etc., and hence are already equipped with service facilities adequate for a large demand.

Although the limitations on starting current vary with different localities, a representative set of regulations are found in the N.E.L.A. recommendations of 1923. These recommendations were not officially adopted by the Association, but with later modifications they serve as a guide for many companies. In substance, these rules allow a starting inrush (locked rotor current) approximately five times normal current for motors of ½ hp. to 25 hp. For ratings below ½ hp. a limit of 20 amperes locked rotor current (15 amperes free rotor) is generally accepted, this limit being based on the capacity of standard house wiring.

For fractional horsepower motors, the standards of apparent efficiency (i.e. product of efficiency and power factor) which are generally recognized throughout the industry, provide two classifications depending on the total length of time the motor ordinarily operates within a year. Long annual service includes apparatus which normally operates over 1000 hr. per year. For such service, which includes most of the air conditioning applications which employ fractional horsepower motors, the total energy use is sufficient to justify a motor of relatively high efficiency and power factor. The short annual service classification (less than 1000 hr.) permits some sacrifice of these operating characteristics to permit a lower first cost.

Types of Motors Available

Single Phase Motors: Single phase squirrel cage motors using a resistance-reactance phase-splitting arrangement for starting are available in sizes up to approximately ¼ hp. The starting torque efficiency (torque per ampere of starting current) is low, but in the smaller sizes, sufficient starting torque for many applications may be obtained without exceeding the starting current limitations. As shown in Fig. 1, this type of motor can

†Air Conditioning Dept., General Electric Company.
‡Industrial Engineering Dept., General Electric Company.

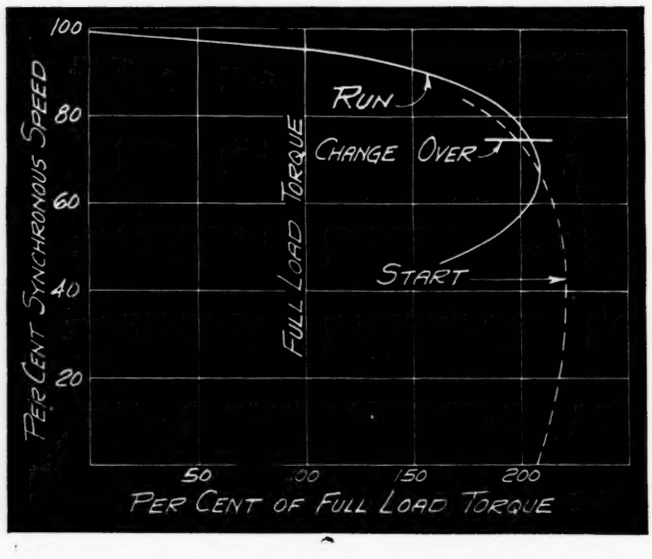


Fig. 1. Characteristics of resistance type split phase motor

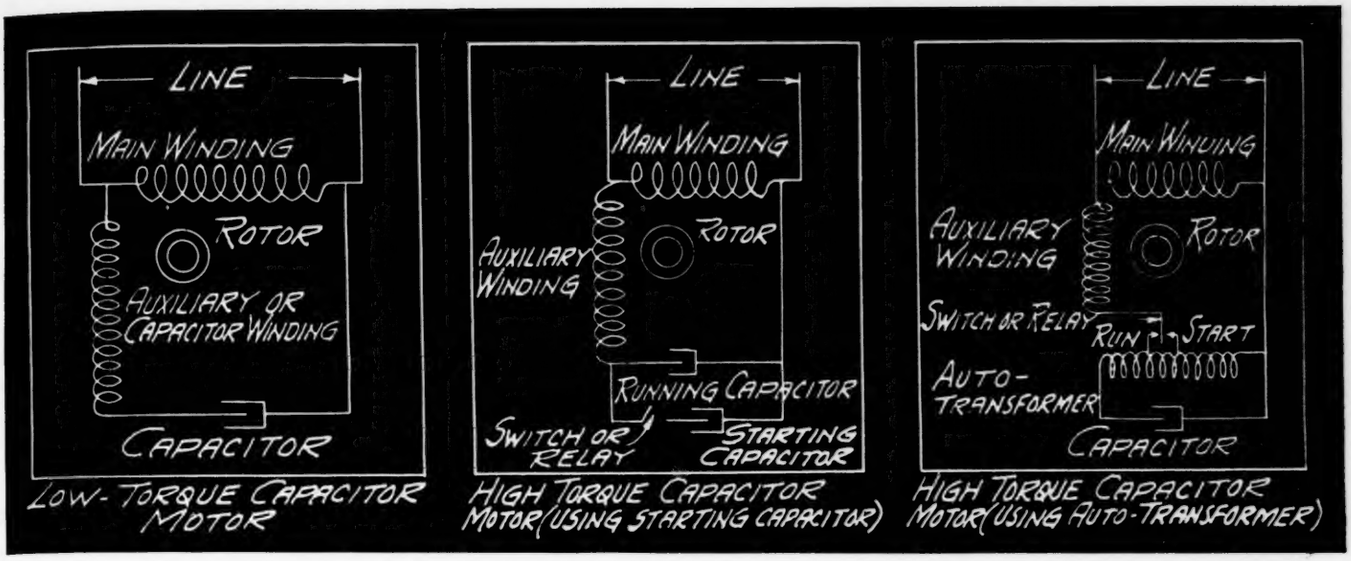


Fig. 2. Connections for high and low torque capacitor motors

develop approximately 150% to 175% starting torque, with the locked rotor starting current of the order of four to five times normal.

Commonly built in sizes above ¼ hp., the repulsion induction motor can be used to advantage in the larger ratings up to the allowable limit for single phase motors. The starting torque is 3 to 3½ times the full load running torque (Fig. 5). The starting current, which is 3½ to 4 times the full load running current is unusually low, considering the high starting torque which these motors develop. Whereas the split phase motor operates at full speed with part of the winding inactive, the repulsion induction motor runs with all of the winding in service. Therefore, higher efficiencies are obtainable with the repulsion induction motor.

The capacitor motor is a single phase squirrel cage motor which utilizes an auxiliary winding and a capacitor to produce a rotating field similar to that produced in a polyphase motor. The development of this motor has proceeded very rapidly within the last few years, as more reliable capacitors have been made available at lower cost. The size of capacitor which can be used while running at full speed is limited to a fairly narrow range, since other values would cause distortion of the magnetic field, and hence vibration and noise. With this value of capacitance, the motor develops a very low starting torque and can be used only with machines having very light starting requirements.

However, the capacitor motor is used where very heavy starting duty is involved, by making a change in the capacitor connection, as between the starting and the running conditions. The high torque capacitor motor differs from the low torque only in the additional capacitance used for starting. Of the methods used for obtaining additional capacitance during starting, the most common are, first, the use of an extra block of capacitors used only during the starting period and second, the use of an auto-transformer by which overvoltage is applied to the capacitor during the starting period, and normal voltage during the running period. A starting torque as high as that of the repulsion induction motor may be obtained by the choice of a suit-

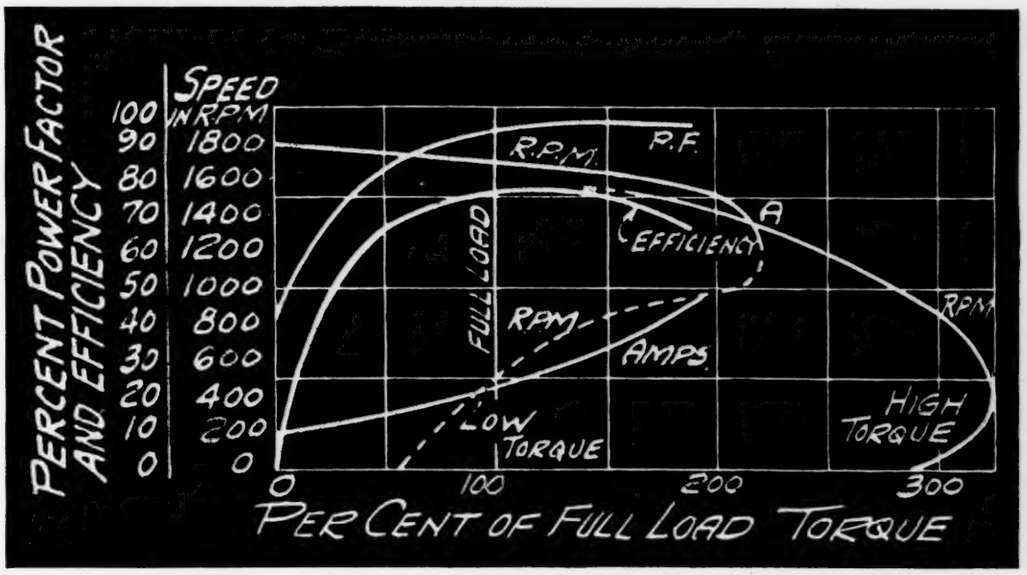


Fig. 3. Characteristic curves of low and high torque capacitor motors

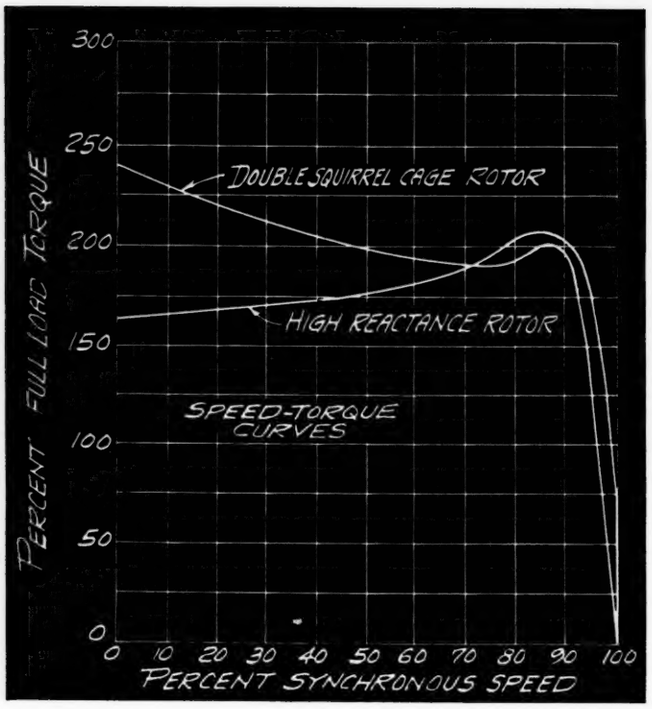


Fig. 4. (Left) Speed torque curves of polyphase motors

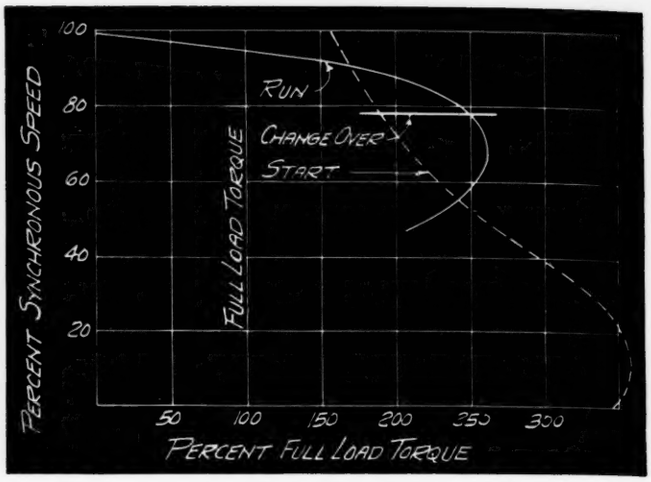


Fig. 5. (Above) Characteristics of repulsion induction type motor

able capacitance for starting, and this value can be controlled by varying the effective size of the capacitor used for starting.

Changeover from starting to running connections may be accomplished manually, although such control provides no assurance that this changeover will be made in time to prevent over-heating. Therefore, the changeover is usually made automatically, either by a centrifugal switch built into the motor or by external relays operating on the changes in current or voltage which occur during the accelerating period. Adjustable speed characteristics down to 50% of full load running speed are obtainable by the use of a high resistance rotor and by the adjustment of line voltage with series resistors or tapped transformers. Fig. 2 shows the connections for both the high torque and the low torque capacitor motors, and Fig. 3 shows the corresponding characteristics.

Polyphase Motors: Where polyphase motors are used in domestic air conditioning plants, the motor sizes will be large enough so that a low starting current will be a necessity. The high reactance motor with moderate starting torque and double squirrel cage motor with high starting torque (Fig. 4) represent two types of designs in which low starting current is obtained with some sacrifice of efficiency and power factor, as compared with the standard low reactance squirrel cage motor. Although still lower starting current can be obtained with high starting torque by resorting to the wound rotor induction motor with external resistance for starting, the cost and complication of the control involved are such that the application of this motor appears to be limited principally to apparatus of larger size.

In a future issue the authors will discuss the motor requirements of specific air conditioning equipments and special problems encountered in occasional jobs.

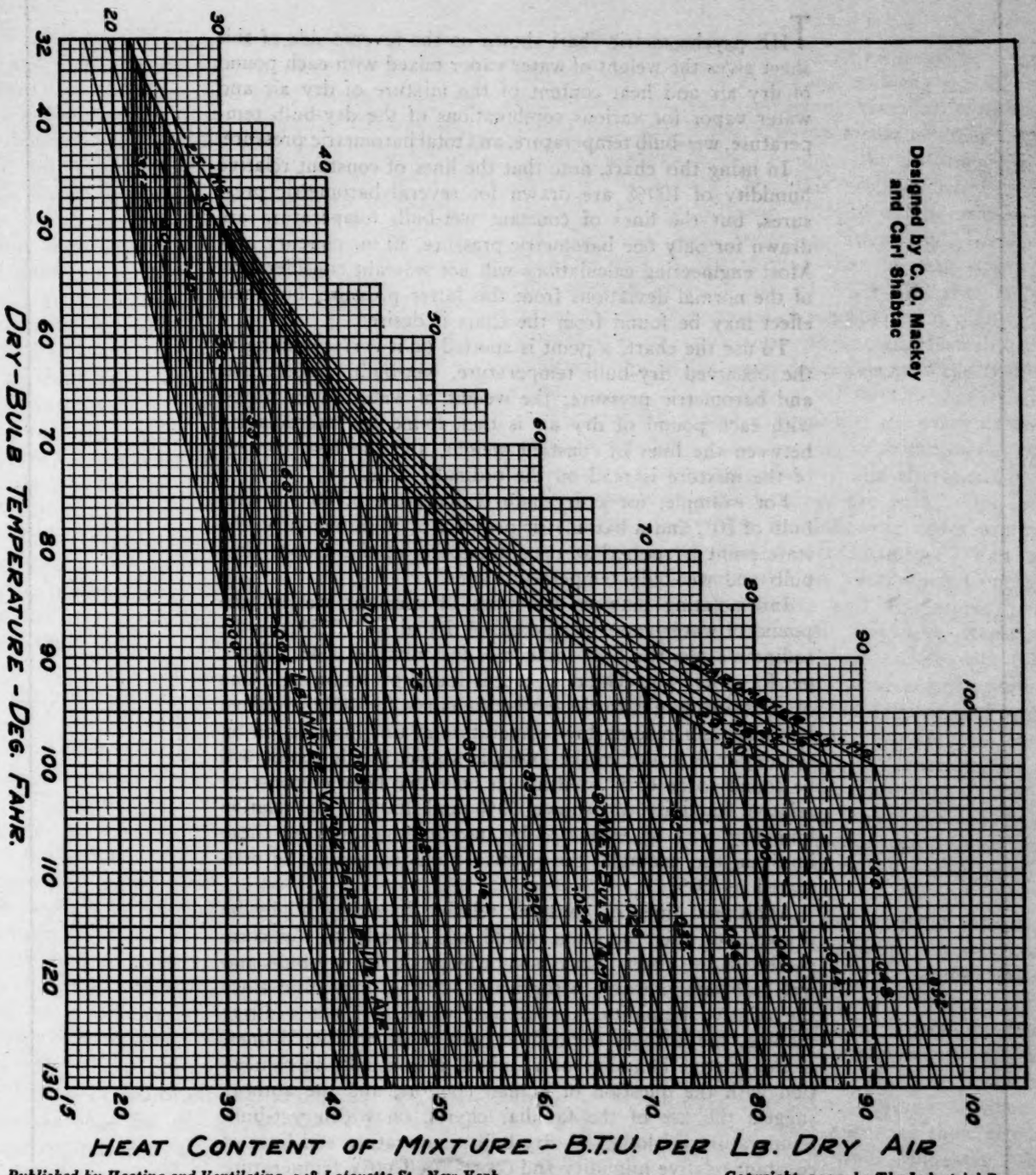
New York Temperature Ranges 115° in 63 Years

DR. JAMES H. KIMBALL of the United States Weather Bureau, atop the Whitehall Building at the lower end of Manhattan Island, has gathered together some interesting statistics on New York's weather during the 63 years for which official records are available.

During that period, there have been only 49 days on which the thermometer has registered zero or colder. The coldest day recorded since 1871 was December 30, 1917, when New Yorkers shivered with the thermometer at 13 below. The recent cold snap, when the official temperature fell to 3° below zero on December 29, was the first zero weather to visit the city since January 27, 1927, when the temperature was —1°.

Zero and sub-zero weather seems to be confined to the three months, December, January, and February. The earliest date shown by Doctor Kimball's records is December 10, 1876, with 2° below; the latest date shows February 24, 1873, with 4° below. It is remarkable to note that the highest recorded temperature, 102° on August 7, 1918, occurred during the summer immediately following the winter when the all-time low was reached.

COMFORT AIR CONDITIONING CHART (32°-130°)



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H & V.'s REFERENCE DATA—27

COMFORT AIR CONDITIONING CHART (32°-130°)

THE psychrometric chart shown on the reverse side of this sheet gives the weight of water vapor mixed with each pound of dry air and heat content of the mixture of dry air and water vapor for various combinations of the dry-bulb temperature, wet-bulb temperature, and total barometric pressure.

In using this chart, note that the lines of constant relative humidity of 100% are drawn for several barometric pressures, but the lines of constant wet-bulb temperature are drawn for only one barometric pressure, 30 in. mercury abs. Most engineering calculations will not warrant consideration of the normal deviations from this latter pressure, but their effect may be found from the chart if desired.

To use the chart, a point is spotted on it corresponding to the observed dry-bulb temperature, wet-bulb temperature, and barometric pressure; the weight of water vapor mixed with each pound of dry air is then found by interpolating between the lines of constant weight, and the heat content of the mixture is read on the ordinate scale.

For example, for a dry-bulb temperature of 80°, a wet-bulb of 70°, and a barometric pressure of 30 in. mercury, the state point is spotted at the intersection of the proper dry-bulb and wet-bulb temperature lines.

Interpolating between the lines of constant weight, the pound of water vapor per pound of dry air is 0.0133; on the ordinate scale, the heat content of the mixture is 43.7 B.t.u. per lb. of dry air. The dewpoint is found by following a line of constant weight to the left to the curve for 100% relative humidity and reading the temperature at this intersection on the dry-bulb scale; in the example above, the dewpoint will be found to be 65.5°. Although only two lines of constant relative humidity are shown (0% and 100%) the relative humidity may be *estimated* by interpolating between these lines; in the example, the relative humidity would be estimated as 60%.

Additional lines of constant relative humidity might be drawn, but their addition would add greatly to the complexity of the chart. Since a knowledge of the dry-bulb and wet-bulb temperatures is the usual starting point, and since the relative humidity is a derived value and not a direct reading, the authors decided to omit these additional lines. If the relative humidity be required, it is usually in connection with the question of human comfort, and the authors suggest the use of the familiar charts, on which wet-bulb temperature is plotted vs. dry-bulb temperature and lines of constant relative humidity and constant effective temperature are drawn, as auxiliary charts in connection with the accompanying chart.

Keeping Up to Date on the Code Situation

NRA codes moved along steadily during the past month, and over 200 are now approved. With many of the codes for the larger and basic industries out of the way more attention to the remaining smaller ones became possible. Jurisdiction over the final approval of the codes of those industries employing normally less than 50,000 employees was delegated to General Johnson by an executive order dated December 30. This move was intended to relieve the President of detailed attention to the smaller industry codes.

There is a record of only one code relating to heating, ventilating, or air conditioning having received presidential approval during December or during January up to the time of writing.

Public hearings have continued, however. Late in December hearings were held on the codes for the manufacture of concealed radiators, unit heaters, and unit ventilators, and for the fan and blower industry. In the latter part of January the steam heating equipment, warm-air register, and the rock and slag wool manufacturing codes came up for hearings. So, too, did the one presented by the extended surface manufacturing industry. Another was for the non-ferrous hot water tank industry. All these are now in the stage of awaiting final action.

When the proposed code for the natural gas industry came up for hearing early in January, strenuous objections were offered by the bituminous coal interests to the omission from the code of any rules for fair practice. The coal men contended that this omission was gravely injurious to them. The whole situation regarding the various fuels is ticklish, with the competitive situation so acute. Just what arrangements will finally be made is not yet indicated.

On January 13 it was announced that the plumbing fixture code had received approval to be effective on January 16. It is interesting to note that the section providing for a differential between wholesalers and other classes of purchasers, which provision of the code had met with sharp objections, was suspended for a period of 60 days.

The master code for the construction industry received approval of General Johnson some time ago and was passed on to the President. His final approval has not yet been received, although momentarily expected. Labor continues to offer stubborn resistance to its provisions regarding hours and wages, the make-up of the governing board and the inclusion of building construction with general construction.

Last month we outlined a plan proposed by Deputy Administrator Beverly S. King whereby an Institute of Heating and Air Conditioning Manufacturing would be formed and would sponsor a master code for the several manufacturing groups. As yet there is no definite indication of how this proposal has been received. At the instance of four of the sub-groups Mr. King has been invited to attend the A.S.H.V.E. meeting and it is expected that he will speak on the purpose and progress of NRA and that he will elaborate on his proposal of a master code. This plan should help to crystallize sentiment and furnish a possible starting point for the development of the Institute idea.

There is still confusion regarding the exact status of some of the NRA codes because of withdrawals, combination of groups, amendments, and alterations to the codes even after their hearings are held. Our latest information shows that the following codes are now awaiting approval of the administrator: Fan and Blower, Unit Heater and Unit Ventilators, Concealed Radiators, Cast-Iron Boilers and Radiators, Steam Heating Equipment, Warm-Air Registers, Rock and Slag Wool Manufacturing. Others on file with NRA and under consideration in various stages of progress: Furnace Pipe and Elbow Manufacturing, Furnace Blowers, Stokers, and Air Filters. A code for Control Instruments is reported in course of preparation. Pipe Covering is included under the Insulation Materials Code. The Radiator Cabinets and Covers Industry is expected to submit a code but our record shows none on file. Neither is there any record of a code for Unit Coolers.

Confusion also exists as to exactly what equipment is covered in some of the manufacturing industry codes now at hand. Just where given items of equipment are placed will eventually be a question of importance as the codes begin to go into operation. Amendments are constantly taking place and re-alignments are still numerous. The following check list gives the actual wording of some of the important codes as they attempt to define just what "industry" they propose to cover. The name of the industry as printed on the code is given in italics in each case together with the name of the sponsoring body and the Registry Number of the code.†

†Full copies (at 5 cents each) of any of the codes listed can be obtained by addressing the Superintendent of Documents, Washington, D. C. When ordering, give Registry number.

Refrigerating Machinery includes "the engineering, design, and production in the United States of commercial and industrial ice making and refrigerating machinery and equipment incidental thereto. It is expressly stated for the purpose of this Code that it is to apply to the engineering, design, manufacture, and sale, as well as erection and/or installation of such machinery and equipment incidental thereto. Any work or process incidental to and carried on by an employer at his plant or elsewhere as a part of the manufacture of any product of the Industry shall be governed by the provisions of this Code rather than of any other Code." Sponsor: Refrigerating Machinery Association. Registry No. 1328-09.

Unit Heater and/or Unit Ventilator Manufacturing, includes "the manufacture or assembly, and distribution or sale of unit heaters and/or unit ventilators, as herein defined, and such related branches or subdivisions as may from time to time be included under the provisions of this Code by the President of the United States, after such notice and hearing as he may prescribe.

"The term 'Unit Heater' means a combination of a steam or hot-water air-heating unit and a fan or blower, having a common enclosure and intended to be placed within or adjacent to a space to be heated. Generally no ducts are attached to the outlets or inlets. A 'Unit Ventilator' is similar in principle of operation to a unit heater but is designed to use all or part of outdoor air. Unit Heaters are mainly intended for factory or industrial use, whereas Unit Ventilators are intended largely for school and office ventilation and/or heating. Where a question arises as to whether a particular device is a Unit Heater or a Unit Ventilator, the decision shall rest with the Code authority, hereinafter defined, subject to the approval of the Administrator." Sponsor: Industrial Unit Heater Association. Registry No. 1304-04.

Fan and Blower includes "the manufacture and the sale by manufacturers of fans, blowers, and air washers with their accessory equipment as used in the heating and ventilating business and as applied to drying, mechanical draft, air conditioning for both industrial and human comfort purposes. Electric ventilating fans other than desk, wall, or ceiling fans (commonly termed 'buzz fans') shall be classified as coming within the scope of this definition." Sponsor: National Association of Fan Manufacturers. Registry No. 1304-03.

Metal Tank includes "the manufacture of standardized steel or other metal tanks and containers when shipped in a finished condition or when sold from a published price list, including, but not limited to, the items as generally set forth in Schedule A, but not including the manufacture of such products when made by a producer of other equipment as part of his own products or as replacement parts and not for sale as separate tanks and containers for other usage." Sponsor: National Steel Tank Association. Registry No. 1136-01 (Presidential Approval, December 15, 1933).

Air Filter includes "the manufacture for sale of equipment used solely for the cleaning of air and other gases, and parts thereof, and includes all those engaged in such manufacture for sale." Sponsor: National Association of Air Filter Manufacturers. Registry No. 1304-05.

Warm Air Furnace Manufacturing, includes "manufacturing and selling by manufacturers of cast iron or steel warm air heating furnaces in the United States." Sponsor: Warm Air Furnace Manufacturers Institute. Registry No. 1103-07 (Presidential Approval, November 27, 1933).

Gas Appliances and Apparatus includes "gas ranges, gas water heaters, gas space heaters, domestic gas boilers, domestic gas furnaces, domestic gas conversion burners, gas refrigerators, gas meters, gas thermostat controls, gas mantles, and, generally, gas appliances and gas apparatus of all styles, types, and kinds for use in the production, distribution, and utilization of natural gas, liquefied petroleum gases, and of manufactured gas, including uses in cooking, heating, refrigeration, and lighting, excluding, however, any products covered by other codes approved by the President." Sponsor: Gas Appliances Institute. Registry No. 1129-1-11 (Presidential Approval, November 27, 1933). Tank water heaters are also manufactured under this code.

Pipe Nipple Manufacturing includes "the manufacturing (for sale) of pipe nipples. The term 'pipe nipple' or 'product' as used herein means and includes a mechanical fitting used in connection with heating, ventilating, plumbing, and other equipment made from wrought steel (including copper bearing steel), genuine wrought iron, brass and copper pipe of various diameters up to and including twelve (12) inches and of various lengths up to and including twenty-four (24) inches in length and threaded on both ends or otherwise threaded or cut to the specifications of the purchaser." Sponsor: The National Association of Pipe Nipple Manufacturers, Inc. Registry No. 1128-02 (Presidential Approval, November 27, 1933).

Heat Exchange includes "the manufacture for sale of steam and vapor condensers, tubular heat exchangers, storage heaters, direct contact heaters, deaerators, cooling towers, and kindred and allied apparatus and/or parts thereof." Sponsor: Heat Exchange Institute (in association with Machinery and Allied Products Institute). Registry No. 1129-1-10 (Presidential Approval, October 11, 1933). Indirect water heaters also manufactured under this code.

Non-Ferrous and Steel Convector Manufacturing includes "the manufacture or assembly and distribution or sale of Non-ferrous and/or Steel Convectors (concealed radiators) used for steam or hot-water heating; and such related branches or subdivisions as may from time to time be included under the provisions of this Code by the President of the United States, after such notice and hearing as he may prescribe. Where a question arises as to whether a particular device is or is not a Nonferrous or Steel Convector, the decision shall rest with the Code Authority hereinafter defined, subject to the approval of the Administrator." Sponsor: Concealed Heater Manufacturers Association. Registry No. 1131-01.

Stoker includes "the manufacture and sale of stokers having not over fifty (50) square feet of effective grate area and/or parts thereof, and is intended to include all those engaged in such manufacture and/or sale.

"The term 'Stoker' as used herein describes the product of the industry as a mechanical and/or power-driven device for feeding coal or solid fuel into a furnace or boiler, equipped with either grates or retorts, admitting air, and including means of draft regulation for proper combustion." Sponsor: Stoker Manufacturers Association. Registry No. 1399-1-13.

Warm Air Register includes "manufacturing and selling by manufacturers of air registers, register faces, cold-air faces, floor borders, adjustable ventilators, intakes, wall frames, pipeless furnace gratings, manufactured of metal; for heating, cooling, or ventilating, and such branches or subdivisions thereof as may, from time to time, be included under the provisions of this Code." Sponsor: The National Warm Air Register Manufacturers Institute. Registry No. 1118-12.

Steam Heating Equipment includes "the manufacture and distributing under their own trade names of all equipment for low pressure steam-heating comprising: Radiator Traps, Packless Radiator Supply Valves (all types), Radiator Supply Valve Orifices, Float and Thermostatic Traps, Boiler Return Traps, Air Eliminators (Vapor Type), Strainers for Protection of Traps and Valves, Lift Fittings, Vapor Damper Regulators, other products which may come within the gen-

eral classification of low pressure steam heating equipment." Sponsor: Steam Heating Equipment Manufacturers Association. Registry No. 1129-1-05.

Cast Iron Boiler and Cast Iron Radiator includes "manufacturing and selling by members Cast Iron Boilers and/or Cast Iron Radiators and/or Cast Iron Hot Water Supply Boilers, in the United States and Alaska." Sponsor: Institute of Boiler and Radiator Manufacturers. Registry No. 1103-05.

Steel Boiler Manufacturing includes "the manufacturing of all types of steel steam boilers for stationary and marine use (except boilers for locomotives and such boilers as may be specifically covered by codes approved hereafter by the President), stokers of 36 square feet of grate area and over, pulverized fuel equipment, superheaters, air preheaters and economizers, and Class One welded pressure vessels, as defined in the unfired pressure vessel section of the Boiler Code of the American Society of Mechanical Engineers, and, with the approval of the Administrator, such other affiliated groups as may request inclusion." Sponsor: American Boiler Manufacturers Association. Registry No. 1103-01. (Presidential Approval, October 3, 1933).

Oil Burner includes: "A. *Classes of Equipment*—For the purpose of the administration of this Code, all products of the Oil Burner Industry shall be broadly defined as follows:

"Class 1. Domestic Oil Burners which shall be motor driven or otherwise, designed primarily for use with central heating plants in one or two family dwellings or similar uses.

"Class 2. Commercial Oil Burners which shall be motor driven or otherwise, designed primarily for application to the heating plants of multiple dwellings and commercial and public buildings or similar uses.

"Class 3. Boiler-Burner Units which shall be combinations of oil burners and boiler or furnaces, designed primarily for heating domestic or commercial types of buildings or similar uses.

"Class 4. Distillate Oil Burners which shall be burners designed primarily for use in connection with cooking ranges, space heaters and domestic water heaters or similar uses as follows:

"(a) Conversion burners consisting of distillate burners designed to be installed in cooking and heating units.

"(b) Cooking or heating devices manufactured expressly for use with oil burners, the burners becoming an integral part of the unit at the point of manufacture.

"Class 5. Industrial burners, which shall be burners designed primarily for producing heat or power for industrial process and/or purposes.

"B. Units of the Industry—Where used in this Code the following definitions shall apply.

"1. Manufacturers are persons, including but not limited to, individuals, partnerships, associations, or corporations engaged in the production of oil burners by fabrication and/or assembly.

"2. Distributors are persons, including but not limited to, individuals, partnerships, associations, or corporations operating under a contract and/or franchise to purchase burners from a manufacturer and whose oil-burner business is the sale of oil burners to dealers for resale at retail.

"3. Dealers are persons, including, but not limited to, individuals, partnerships, associations, or corporations operating under a contract and/or franchise with a manufacturer or distributor and whose oil-burner business is the sale of oil burners at retail." Sponsor: American Oil Burner Association. Registry No. 1125-01 (Presidential Approval, September 18, 1933).

Pump Manufacturing includes "the manufacture for sale of pumps, pumping equipment, and/or parts thereof except as manufactured and sold solely as an original or as a replacement part of the product of another industry as now or hereafter organized, and except that there shall not be included therein the manufacture for sale of hand pumps, windmills, and domestic water-supply systems and parts and accessories thereof." Sponsor: Hydraulic Institute (in association with Machinery and Allied Products Institute). Registry No. 1326-1-02. (Presidential Approval, October 11, 1933.)

Non-Ferrous Hot Water Tank includes "the manufacture for use or for sale of copper and other non-ferrous range boilers and non-automatic storage tanks." Sponsor: Non-Ferrous Hot Water Tank Manufacturers Association (A subdivision of the Fabricated Metal Products Manufacturing and Metal Finishing and Metal Coating Industry). Registry No. 1129-1-14.

Extended Surface includes "the manufacture for use or for sale of Extended Surface parts such as fin type evaporators, condensers and/or other Extended Surface parts used for heat transfer purposes in refrigeration and air conditioning." Sponsor: Association of Extended Surface Manufacturers. (A sub-division of the Fabricated Metal Products Manufacturing and Metal Finishing and Metal Coating Industry). Registry No. 1328-14.

Steel Tubular and Firebox Boiler includes "all manufacturers of steel heating boilers as defined in Section IV, Sub-Section I, of the Boiler Code of the American Society of Mechanical Engineers; also, for all working pressures, Scotch type boilers for stationary use, vertical fire tube boilers, horizontal firebox type boilers, tubeless boilers, oil country boilers, miniature boilers." Sponsor: Steel Heating Boiler Institute. Registry No. 1129-1-17. (Presidential Approval, October 23, 1933).

Automatic Sprinkler includes "the manufacture of automatic sprinklers and devices and the fabrication and installation of automatic sprinkler equipments." Sponsor: National Automatic Sprinkler Association. Registry No. 1118-01. (Presidential Approval, October 9, 1933).

Construction "consists of selling and/or installing systems, or parts thereof, for steam and hot water heating, ventilating, refrigeration, air conditioning, pipe covering, power piping, industrial process piping, sprinkler piping, temperature control piping, oil burners and burner-boiler units, or such other piping or equipment as is installed by steam fitters or sheet-metal workers." Sponsor: Heating, Piping and Air Conditioning Contractors National Association. Registry No. 1130-03.

Ice includes "the production, manufacture, harvesting, selling, or distributing and/or merchandising of ice at wholesale or retail." Sponsor: National Association of Ice Industries. Registry No. 126-01. (Presidential Approval, October 3, 1933).

Valve and Fittings includes "all designs of valves, pipe-fittings and accessories, of all classes of ferrous and non-ferrous materials, for use in the handling of all classes of fluids and gases, such as steam, water, oil, gas, air, etc.

"(a) Provided, however, that as used in this Code these terms shall not apply to valves or fittings made by a producer of assembled units of equipment for his use as integral parts of such units or as replacement parts therefor and not for sale as separate valves or fittings for other usage.

"(b) Excepting, further, plated or plain brass plumbing fittings, shower fittings, lavatory fittings, sink fittings, drinking-fountain fittings, and other finished plated or plain brass fittings, for use in connection with plumbing fixtures.

"(c) Excepting, further, such gas cocks as are used in connection with household appliances such as for refrigerating, lighting, heating, and cooking." Sponsor: Valve and Fittings Institute. Registry No. 1335-1-03.

Few Objections Made to Proposed Steam Heating Code

DISCUSSIONS on provisions relating to labor, open price provisions, "free engineering," and guaranteeing of steam consumption by manufacturers of systems were among the features of the NRA hearing on the Code of Fair Practices and Competition for the Steam Heating Equipment industry held January 23 in Washington. Assistant Deputy Administrator Beverly S. King presided, the industry being represented by E. K. Lanning of Warren Webster & Company.

Mr. Lanning stated that the industry he represented has about 20 members, about 18 or 19 of whom have signed up or will sign up with the Steam Heating Equipment Manufacturers' Association, with only one manufacturer not likely to become a willing member. The Association claims to represent over 90% of the industry by sales volume.

The International Association of Machinists submitted a brief asking for amendments to that part of the code relating to labor. This union asks for a 30-hr. week instead of the 40 hr. called for by the proposed code. Other amendments requested by the Machinists were that no persons less than 16 be employed; a minimum rate for unskilled labor of $25 per week; a minimum rate of $48 per week for machinists and maintenance men, and that there be no overtime except in cases of extreme emergency and except for maintenance and repairs. Where overtime is necessary, double time should be paid, the union urged.

In regard to the provisions relating to hours and wages Administrator King stated that these were going to be revised, very likely along the lines of the Fan and Blower Industry Code.[1]

The Mail Order Association of America objected to trade practices called for in the code requiring that members "shall publish and file with the Code Authority, a price sheet showing the net prices to the consumer and to the heating contractor, of all types, varieties and sizes of the products covered by this Code, including cash and/or quantity discounts, transportation terms, guarantees, and any other terms or conditions which may affect the net costs of any article to the consumer or heating contractor." The Association members claimed that this is a subterfuge to outright price fixing and contrary to the best interests of the industry and the consumer. In their opinion, all that should be called for by the Code would be a provision restricting sales below cost, such cost to be determined on the basis of production and the resale price based on cost of production plus cost of distribution.

The mail order houses also objected to Article VII, Rule 18, which calls free engineering an unfair trade practice. The proposed code requires that engineering service in the way of plans and specifications if rendered, must be paid for. Mail order houses stated that this provision is indefinite and requested modifications to the extent that the cost of such service should be included in the cost of distribution.

The National Association of Master Plumbers asked permission to file a brief in connection with the Code, to which Mr. Lanning replied that as plumbers, employing plumbers, they have no connection with the industry, except that many plumbing shops do heating work as well as plumbing. It was Mr. Lanning's understanding, however, that the heating contractor industry was covered by the code for the heating, piping and air conditioning industry, and therefore claimed that the master plumbers had no right to file a brief.

Webster Tallmadge & Company, Inc., presented a brief, stating that some of the steam heating equipment manufacturers guarantee steam consumption of buildings using their equipment and permit the building owner to pay for the equipment out of steam savings. This company, in its brief, claimed that this is an unfair trade practice, and claimed also that it was equivalent to selling at a reduced price if guarantees are made under unforeseen improper conditions. The company offered an amendment calling for the elimination of this pactice.

W. W. Swift of the legal division of NRA asked whether the practice called for in the proposed code in regard to the classification of purchases was according to past practice. Mr. Lanning replied that the practice called for in the code is merely a statement of practice which has existed in the industry for a number of years.

Mr. Lanning proposed an amendment to Rule 9 which now reads "It shall be deemed an unfair method of competition to make a particular sale of products of this Code contingent upon the sale of any other goods or materials not covered by this Code." The amendment called for the adding of the following words:

"Provided, that this rule shall not apply to patented heating systems and other products not covered by the Code, in which the Code products serve as component parts."

Among those present at the hearing were the following representatives of various divisions of NRA: C. H. Sudler, Industrial Advisory Board; R. S. Newham, Labor Advisory Board; R. A. Martino, Consumers' Advisory Board; J. A. Hanley, Planning and Research Division, and W. W. Swift, Legal Division.

[1]The revised Fan and Blower Code calls for one and one-half time for hours in excess of 48-hr. week for an 8-hr. day, except for maintenance and repair men for whom separate provisions were set up.

Architect, Robert Frost Daggett *Consulting Engineer, C. R. Ammerman*

Heating and Ventilating the New Indiana University School of Dentistry

By TELFORD R. DAVIS†

AT this writing, the new building which will house the Indiana University School of Dentistry, Indianapolis, is nearly completed. The original Indiana Dental College was established June 26, 1879. At this time there were only eight other dental colleges in America. West of the Allegheny Mountains only three schools were in operation. Indiana, therefore, was a pioneer in promoting the dental profession to higher standards of scientific efficiency.

The new home of the dental school will be a close neighbor of the James Whitcomb Riley Hospital for crippled children, and the dental school will be provided wth a separate children's clinic unsurpassed in America.

General

On the ground floor will be waiting rooms, general offices, and rooms necessary for carrying on the freshman curriculum, the freshman locker and toilet room, freshman laboratory and lecture room, and laboratories for anatomy, chemistry and metallurgy, histology and dental anatomy, bacteriology and pathology, pharmacology and physiology.

On the second floor are additional waiting rooms and, in direct connection, the examination rooms. An extraction clinic will be on this floor for the discharge of regular extraction duties. In connection with the extraction clinic are the surgical demonstration rooms which are provided for the administration of general anesthetics and the very frequent cases of oral surgery. These surgery rooms are provided with sterilization rooms and a scrub-up room, together with small recovery rooms which will provide for the proper care of surgical cases. In close contact with the surgical department is the X-ray department, thoroughly equipped to handle all types of dental radiography.

Also on the second floor will be located the children's clinic and orthodontia clinic. Because of the close connection with the Riley Hospital for children, it is expected that this department will provide a well needed service at the Indiana University Medical Center. Several additional lecture and laboratory rooms for upper classmen will be equipped on this level.

The main clinic will be located on the third floor with all necessary auxiliary rooms which are necessary in the operation of a modern public clinic. In the main clinic will be placed 80 chairs and dental pedestals. In order to properly light the great amount of area occupied by this clinic, it was necessary to give this room a 21-ft. ceiling height, allowing maximum window area on the north wall. A balcony overhangs the south wall, below which will be located the auxiliary rooms. At either end of the balcony is located the exhaust fan rooms and water cooler rooms.

†Designer and engineer in charge, Staff of C. R. Ammerman, consulting engineer, Indianapolis.

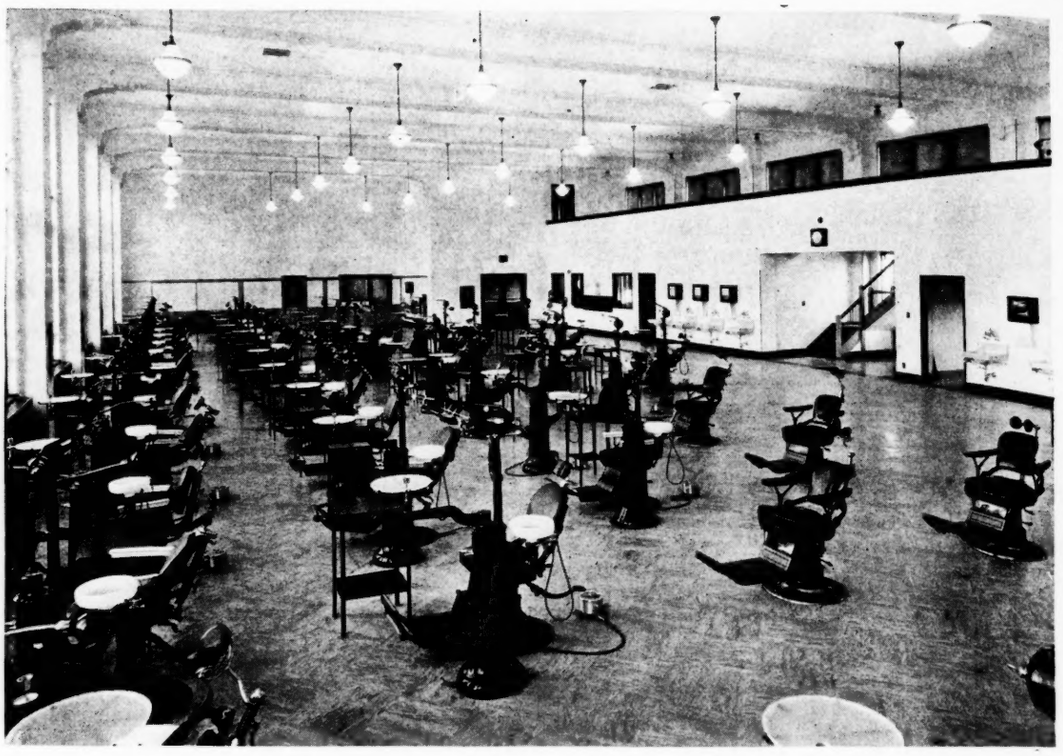

Fig. 1. Main dental clinic. Each chair has individual compressed air piping lines

Piping Systems

It was not necessary to provide an independent heating plant for the building, as all services, except gas and compressed air, are brought from the central heating plant of the university group. All mains distribute throughout the basement area to their respective risers.

The total cost of construction was $223,063, of which $57,963 was spent for the mechanical equipment.

An interesting problem presented itself in the installation of the service tunnel and trench work for conveying steam and hot water lines and electric conduits from a present junction of tunnels servicing the Medical Units across the street from the site of the new dental building. A tunnel 6 ft. 6 in. high by 5 ft. wide was constructed for a distance of 200 ft. from the aforementioned junction and terminating in a pipe pulling station or offset at the property line on the north side of the street. From this point a 48 in. concrete pipe conduit was constructed under the street and up to the front of the building. In crossing the street it was necessary to construct this conduit below a main sewage intercepter which was constructed of masonry and about 3 ft. × 2 ft. inside; further, the street car and other traffic could not be interrupted while the construction was in progress.

A plan for the procedure of this work, approved by the Indianapolis Board of Works, was roughly as follows: The north half of the street above the conduit was excavated first, and during the progress of the work, wire cables were carried around the masonry sewer with boards placed between the cables and the sewer sides. The cables were then carried around timbers laid across the excavation, thus allowing the sewer to be suspended by the cradle thus formed while the excavation proceeded below. After the desired depth was reached, the actual tunneling process was started toward the opposite side of the street, the earth above being held back by means of bulkheads and timbers. After the side walls of the conduit were formed and poured a process of removing the overhead timbers was started by replacing the original timbers by wood arch work and so on until the foremost end of the tunneling

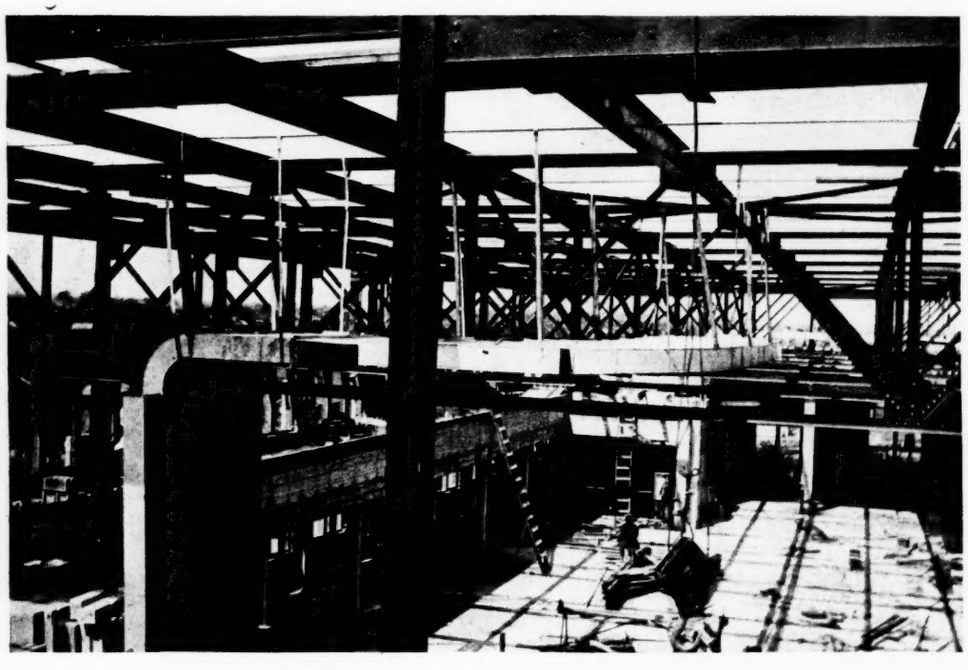

Fig. 2. Ductwork carried through roof steel for ventilating air supply to large clinic illustrated in Fig. 1

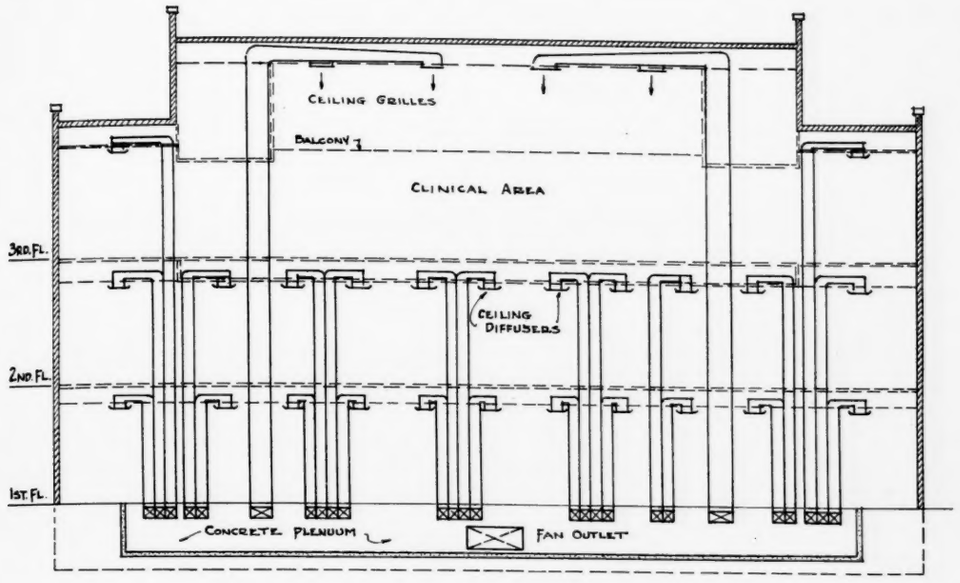

DIAGRAM OF AIR SUPPLY

Fig. 3. The smaller ducts supply individual class and clinic rooms on the first and second floors; the large ones the main clinic on the third floor, which contains 80 dental chairs

had been reached. The top of the tunnel was then formed and concrete poured. Earth was then thrown back in above the conduit top and well tamped and soaked. The wood arches were not removed. The other half of the work proceeded in the same manner, approaching from the opposite direction.

Ventilation

Fresh air for this building is drawn in from an opening located in the fan room wall. No provision was made on this project for the recirculation of air as the system as designed supplies the needs for ventilation only. The original plans incorporated an air washer and humidifier, but this equipment was not installed at this time because of the necessity of conserving all available funds for building construction, since future state expenditures are uncertain. Provisions have been made, however, for the installation of this very important equipment at some later date. After the air is tempered it will be delivered to a concrete plenum chamber running the full length of the basement. From this plenum sheet metal ducts rise up and convey the air to corridor diffusers. All corridor doors are provided with panelouvers allowing the corridor air, under pressure, to filter into the various rooms. Hoods and wall registers vent the various rooms. All toilet systems have their independent fans.

One interesting problem encountered in the ventilation of this building was that of collecting vent ducts which rise from below the third floor level. A large general clinic with a 20-ft. ceiling covered practically the whole of the third floor level and, consequently, no ducts or pipes could be continued up through this area. As a solution to this problem an air-tight plenum formed by the plaster ceiling and the corridor walls of the second floor was used as a terminus for all general ventilating ducts for rooms below the third floor level. From both ends of this ceiling plenum two large sheet metal ducts are carried up to exhaust fans (See Fig. 4). The exhaust from each of the fans will be discharged directly up through roof ventilators; however, a large by-pass duct is taken out of the fan discharge ducts below the roof construction and above the furred ceiling of the clinic. This arrangement will allow a proportionate amount of the warm exhaust air, which would be wasted ordinarily, to be discharged directly in this ceiling space from which it will escape by numerous small roof ventilators placed at several points through the roof. Thus, the plastered ceiling will be

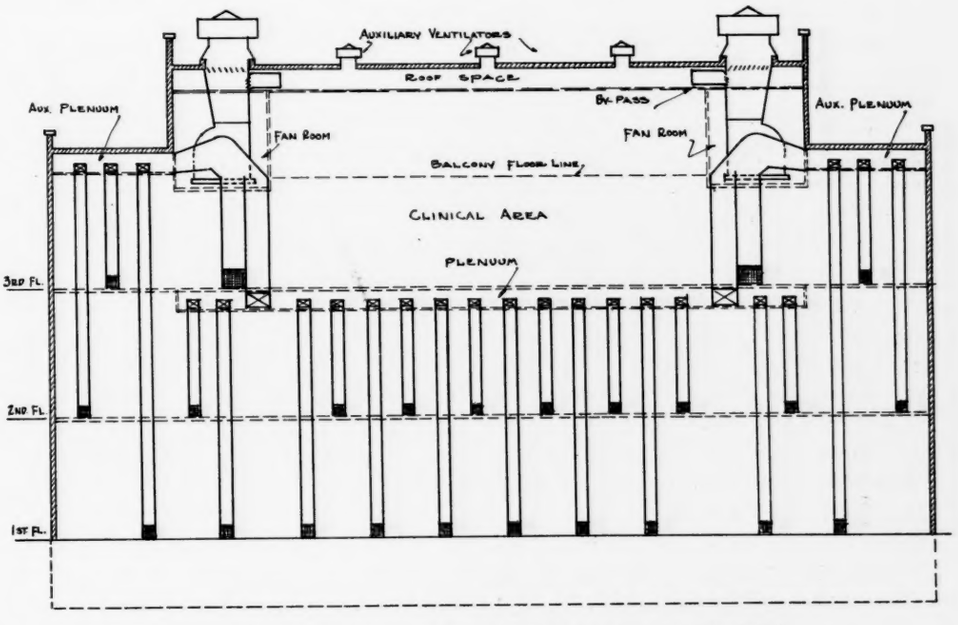

DIAGRAM OF EXHAUST SYSTEM

Fig. 4. Upward exhaust system is used. Note the by-pass which permits supplying the roof space with warmed exhaust air to reduce heat losses

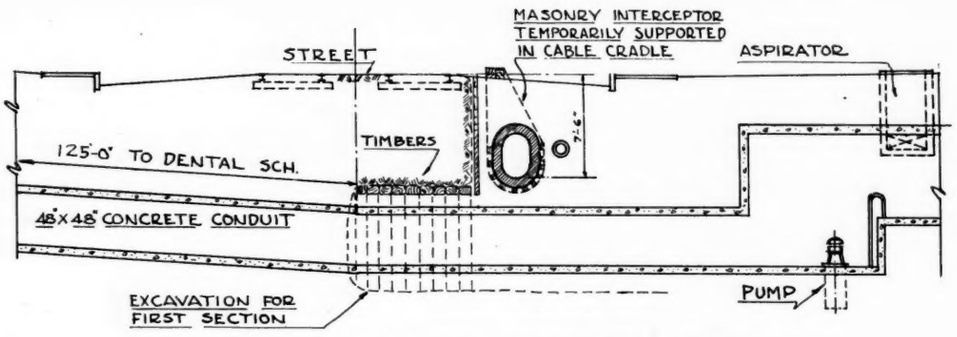

Fig. 5. Details of conduit tunnel serving the building from the central station

kept at a higher temperature at the expense of warm foul air, thereby cutting down transmission losses through the ceiling and prevent the possible forming of condensation which sometimes collects at cold surfaces.

Temperature Control

All spaces to be heated were provided with cast-iron radiators of the solid front type with rear convectors. A perforated sheet metal sill covers the entire top of the units with the rear edge of same carried under the regular slate window sills. All end sections of the radiators are of the full sculptured patterns with sheet metal housings extended from the wall and meeting the edges of the end sections, thus forming a complete enclosed flue behind each radiator.

All radiators are equipped with individual temperature control valves, this type of control having proved quite successful in recently constructed buildings of the Medical Center. In addition to the individual control as outlined above, the entire building was divided into two zones: the East Zone, and the West Zone, respectively. On each of the steam mains supplying these respective zones pneumatically-operated supply valves were installed. The air supply to these two valves is regulated by low limit thermostats located in each of the zones referred to. These thermostats are set at 55°. The thermostats, in turn, are supervised by a spring-wound program clock located in the fan room. Heating schedules will be maintained by the clock, thereby making it possible to carry low night temperatures and low temperatures for holiday heating, at which times the building will not be occupied. Each of the zone thermostats can be made inoperative by manual operation of an air switch, this provision being necessary in order that either zone may be heated up to temperature if for any reason the building may be occupied during a period for which the program clock is set to control at low limits.

Compressed Air Distribution

A 12-c.f.m. air compressor located in the basement machine room furnishes the compressed air for distribution to the numerous dental pedestals with separate distribution to laboratories. Air is compressed at about 100 lb. at the compressor tank. From this tank a main distributes with a pressure reducing valve in line to reduce the pressure to 35 lb. On all branches leading from this main and supplying dental pedestals additional pressure valves are installed to make a further reduction in pressure to 4 oz. or 5 oz., at which pressure it may be used with dental syringes and similar equipment.

British Study Problems of Domestic Coal Heating

DR. F. S. SINNATT, Director of the British Fuel Board, in the Board's annual report states that domestic heating experiments have shown clearly the advantages gained by utilizing reflecting surfaces on open fire backs with the object of increasing the amount of radiant heat and improving the appearance of the fire. Tests were made with polished aluminum foil which remained bright and in good condition for a considerable period. A damp soapy cloth was found to be sufficient to remove any soot or tar which collected on the surfaces and to keep the metal bright. Further work is being carried out on the use of metallized firebricks for use in open grates.

Experiments on the combustion of and smoke emission from coal in open grates were continued. Tests on domestic coals showed that marked differences in behavior may exist between the bright and dull banded constituents. In the particular samples tested the bright coal was found to be superior to the dull coal in rate of radiation and freedom from excessive smoke, but the dull coal was easier to ignite and more rapid in initial combustion.

Doctor Sinnatt refers to the difficulty encountered by the consumer in disposing of small coal (slack or dust). Some experiments are described in which coal dust is placed in a paper container lined with aluminum foil, about the size of a ½-lb. tea packet. It has been found that if such packets are placed in an open fire the aluminum foil holds the coal together until it is converted into coke. If a packet is allowed to remain undisturbed for from 10 min. to 20 min. the volatile products from the coal burn with a luminous flame, leaving a piece of coke, which continues to burn in the ordinary manner.—*A. C. Blackall*

Unfair Competition from Utilities Claimed by Oil Burner Industry

THE advantageous position in which public utilities are placed with regard to the sale of appliances, to the detriment of competitive groups, has been considerably enhanced by the administration of these groups under codes of fair competition, since there are no trade regulations imposed at the present time upon the merchandising activities of the utilities, according to a brief submitted by the Oil Burner Code Authority on January 4 before a hearing in Washington on a code for the natural gas industry. The NRA is urged in the brief to force the utilities to accept a code containing fair trade practice regulations which would remove the unfair competitive advantages utility companies now enjoy over the oil burner, soft coal, petroleum, stoker, and other industries. As a result of this, and similar complaints, Leighton Peebles, New York, deputy administrator of utility codes of fair competition, ruled that the natural gas industry's code be withdrawn for revision.

The Oil Burner Code Authority advocates that the utilities either be required to abandon completely all merchandising of appliances, or else that they be required to segregate their merchandising activities from their public utility functions, and that such segregated merchandising departments be required not only to operate under fair trade regulations but also as though they were separate corporate entities, depending for revenue solely on the sale and service of such appliances under a uniform system of accounting.

In justifying these requests, the brief outlines the four major advantages possessed by the utilities which work to the disadvantage of retailers generally. Since the utility is a monopoly, and because its gas and electric current are necessities, the utility has a tremendous advantage in selling appliances which develop load. The utility can seemingly afford to sell these appliances below cost because they are building load for the utility and the losses sustained can be covered by revenue from sales of gas and electric power, the rates of which are fixed to bring in a definite return. No such profit protection is available to independent merchants. Furthermore, the average retailer cannot compete with the utility's practice of offering merchandise on a small down payment with the credit protection afforded by billing the customer for such time payments when he pays the monthly bill. In addition, the advertising of appliances by utilities has been all out of proportion to the revenue likely to be gained directly by the sale of the appliances. This disparity has been especially true in the matter of the direct sales methods employed through the use of high salaried sales representatives whose compensation is not commensurate with the value of the appliance, particularly when such salaries are not contingent upon sales volumes.

Many other merchandising advantages possessed by the utilities are cited in the brief, including their close contacts with customers, familiarity and access with customers' premises, offers of free service, access to mailing and credit lists of customers. That utilities do not need to realize a profit on their merchandising activities is illustrated by a number of examples, in which certain utilities have shown a loss on the sale of appliances, or have shown small profits only, through alleged unorthodox accounting practices.

It is further charged that in addition to unfair competition, the sale of appliances by utilities is, in some instances, contrary to the best public interest. To illustrate, attention is called to the recent aggressive sales campaign engaged in by gas companies in northern Illinois to sell gas heating in the Chicago area during the course of which, it is claimed, damaging, unethical, and misleading advertising was resorted to.

These utilities, says the complaint, offered free installation of gas burners, to be paid for at a rate of $3 per month rental, apparently a "give away" inducement to sell burners to develop load while losing money on the appliances. There was no guarantee that the advertised low gas rate would be permanent. The pipe line company supplying the gas to one of the utilities protested the new low rates for gas heating to the Illinois Commerce Commission, terming them "confiscatory," and stated that the undertaking, anticipating a maximum daily demand of 130 million cu. ft., constituted a risk of financial loss due to failure of gas supply. That this eventuality is not merely theoretical is pointed out by reference to the waste of natural gas in the Texas Panhandle field, and the ever present danger of damage to pipe lines by the elements.

It is estimated that during three months of the campaign (June, July, and August), during which time the utilities sold 16,000 gas burners, the expense to the utilities totaled in the neighborhood of $2,500,000, not including expenditures for advertising beyond August, and general and administrative costs. The total income to the gas companies from the rental of the burners at the end of the first nine-month heating season will be about $392,000. These sales were therefore conducted on a basis contrary to public interest.

In contrast to these conditions, it is pointed out that under codes of fair competition the petroleum industry is not permitted to sell any but its own products, and is not permitted to offer free service, premiums, etc. Manufacturers of gas appliances and apparatus, under their code, cannot sell or deliver goods on consignment, sell goods below cost, sell merchandise with repurchase agreement, allow excessive trade-in allowances, etc. The Oil Burner Code prohibits similar unfair competitive practices, and like regulations are imposed on the manufacturers of coal stokers.

EDITORIALS

Coordinating the Codes

THE proposal that a central Heating, Ventilating and Air Conditioning Institute be formed to sponsor a basic NRA manufacturing code is worth serious thought by all the manufacturers affected. It comes at an opportune time when so many of the codes are still under consideration and when some of those already approved are not yet in full operation.

Briefly, the proposal would set an Institute at the top of the NRA code organization with a committee to administer the basic code. The several specialized groups, which have codes, would make up the membership of the Institute, and provisions of their codes would be so drawn that they would be in agreement with those of the basic, or master, code.

The proposal has some advantages which can be readily recognized. Among these are increased centralization and probably a clearer recognition of the essentially unified nature of what up to now have been pretty much isolated groups. Centralization of the statistical material called for by the codes, a clearing house for common problems beyond the scope of the specialized sub-groups, better planning, and in some cases a saving in administration costs are among the readily recognized advantages. No doubt if such an Institute were organized it would eventually develop a program which would be valuable in other ways as well.

Whether these advantages would be possible without some counterbalancing disadvantages is not yet apparent. Probably the only way the true picture can be drawn is through discussions either at meetings or through publications. Discussions are already under way and formal support of several of the sub-groups has been obtained. Increased activity looking toward adoption of the proposal can be expected soon. It looks to us like a constructive step and one which is worthy of support.

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The Building Outlook

FIELD reports on the volume of building construction undertaken in the first half of January are encouraging. They are almost double those of a year ago. The gradual rise in new building so confidently predicted some months ago seems to be actually at hand. True, much of the volume is from Federal money but the privately-financed work is also gaining slowly.

Two factors holding back construction are the uncertainty over the final disposition of the NRA construction code and the scarcity of private money seeking investment in real estate.

The situation surrounding the code is still obscure. President Roosevelt has had the code before him for some time. Labor is objecting strenuously to several of the provisions written into it as it passed through the Administrator's office. The final decision involves policy questions and it is well known that this code was expected to be one of the most troublesome in the whole codification program. It is also well known that it is receiving careful attention and there is every reason to expect a definite decision very shortly. If a way can be found to avoid labor troubles the delay in action is easily worth while. If not, then we can expect a period of labor unrest, but the story of similar situations with other NRA codes has been that this period is comparatively short.

The money situation is more difficult. Much money which formerly sought investment in buildings is now going into government securities. The risks in building investment have been forcibly emphasized in recent years and probably some sharing of these risks between private money and public funds will have to be worked out. Preliminary plans along those lines are under investigation. Concrete proposals are expected soon.

On the whole the present condition and the immediate and long-range future warrant a feeling of optimism. We can definitely expect a better year ahead than we had any right to hope for just a few months back.

●

The Exposition

THE third heating and ventilating exposition is all prepared to open. It comes at the end of the most prolonged period of discouraging business which the makers of this equipment have had to face for a long time. Strictly on the basis of the volume of goods used in heating and ventilating in late years one would be entirely justified in believing that there is nothing worth showing at this time. Anyone who thinks this is so, has a surprise awaiting him. Development work and the resulting new products have gone along space in spite of the difficulties. In fact, a considerable part of the equipment exhibited has been developed because of the very lessons learned from the depression itself. Our suggestion is to attend this exposition if possible and see for yourself what is taking place. The exhibits are varied, new, and interesting. Attendance will help you renew your faith in this industry and will show you that it is too virile and too basic to be stopped by a period of depression.

Abstracts . . .

Reviews and Summaries of. . . . Current Papers, Books and Pamphlets

Residence Cooling

Summer cooling for residences is still in the trial and experimental period. First cost and operating cost are two hurdles which any extended use of the practice has to jump. So far they have been disconcerting. Much effort and no little ingenuity have been exercised in trying to find ways of accomplishing the desired cooling at attractive costs. Too often these efforts and ideas have had to end in discussions for lack of a suitable place in which to subject them to study and analysis under field conditions. The research residence at the University of Illinois is an ideal place in which to try out ideas.

The second summer (1933) in which this residence was cooled was devoted to attempts to determine to what extent daytime artificial cooling could be helped by circulating outside air through the building at night, and to what extent it could be used to reduce the necessity for any additional cooling in the daytime. In addition, it was hoped to show at what hours windows could best be opened and when fans should be started. Use of several methods of circulating the night air was arranged for in order to compare their merits.

A program consisting of 12 series of tests was laid out with a 24-hr. test period. The house was equipped with a basement, fan-operated warm-air heating system and also with an attic fan so arranged that it could exhaust air from the living quarters or could merely ventilate the attic space. A central ice cooling arrangement in the basement permitted passing cooled air through the ducts of the warm-air system when desired. Temperature readings were taken at many places throughout the building.

Data obtained during the course of carrying out this program were carefully analyzed and are summarized in considerable detail in the paper. The authors are careful to point out that their findings apply directly only to the research residence itself and generally only to buildings of similar characteristics. As a result of their analysis they present the following nine conclusions:

1. The circulation of air from the outdoors at night, when used as a supplement to artificial cooling during the day, has considerable merit in reducing the seasonal cooling load that would otherwise be required.

2. The circulation of air from the outdoors at night may make the use of artificial cooling unnecessary for a considerable portion of the summer season.

3. If the best means of circulating air from the outdoors at night had been used at the research residence during the summer of 1932 the ice meltage could probably have been reduced from the 43 tons actually used to an amount of the order of 10 tons.

4. The practice of partly opening a few windows at night is not very effective as a means of circulating air from the outdoors.

5. The use of a fan in a forced air heating system to circulate from six to nine air changes per hour from the outdoors at night is much more effective than opening a few windows even when the same amount of window opening is retained for the two cases.

6. The use of a fan in a forced air heating system to circulate nine air changes per hour is more effective if all the windows and the attic door or hatchway are opened than if only a few windows are opened.

7. The most effective method of circulating air from the outdoors at night is to open all the windows and to use an attic fan drawing the equivalent of approximately 17 air changes per hour into the windows of the first and second stories and discharging it into the attic to escape from the attic windows.

8. In the case of a two-story house similar to the research residence having an ample attic with dormer windows and large attic door, opening all the windows and the attic door is nearly as effective for circulating air from the outdoors at night as the use of an attic fan producing approximately 17 air changes per hour.

9. There is some advantage in opening the windows at 6 p.m. rather than at 9 p.m. even if the outdoor temperature is slightly higher than the indoor temperature at 6 p.m.

[*"Study of Summer Cooling in the Research Residence for the Summer of* 1933," *by A. P. Kratz and S. Konzo. An A.S.H.V.E. paper; annual meeting, February,* 1934; 13 *pages;* 13 *illustrations.*]

●

Controls for Forced-Air Heating

Reports results of a study made at the research residence at the Experiment Station of the University of Illinois, the objects of which were to determine what particular features are essential to a good control system, and to compare the performance characteristics of several different types of control systems.

Control of forced-air systems, in which the fan is operated intermittently, is shown to be complicated by the conventional differences in the ductwork for systems intended for forced and gravity operation, since the intermittent operation requires gravity operation when the fan is not running. This necessitates adjustment of the dampers in the leaders to a position that is a compromise between that for gravity and forced operation. Eleven different control systems were tested for a coal-fired forced-air plant, and these included four fundamental systems, characterized as follows: (1) automatic control of furnace damper operation

only, with the fan operating continuously and independent of any control; (2) automatic control of both fan and furnace damper, with fan operating intermittently and damper regulation independent of operation of fan; (3) automatic control of both fan operation and furnace damper operation, with fan operated intermittently during damper-open periods, when it was rendered inoperative, and (4) automatic control of both fan operation and furnace damper operation, with fan operated intermittently and the damper-open periods accompanying either the total or some fraction of each of the fan-on periods.

Operation of representative control systems tested under these fundamental types is described in detail. Charts are presented to show room temperatures, flue gas temperatures, and bonnet temperatures, as maintained by the various systems, and tables represent the power consumptions for the various methods of control. The authors discuss the results, comparing the systems, and pointing out their advantages and disadvantages. Included among the more important conclusions reached are: Uniform room temperature is best maintained by operating the fan by a room thermostat; the bonnet air temperature should be governed either manually or automatically to correspond to the heating demand; a uniform combustion rate, just sufficient to supply the heating demand on the furnace, should be maintained, and this can best be fulfilled by controlling the damper operation by both room thermostat and the bonnet air temperature; equal temperatures in various rooms are best obtained through uniform periods of intermittent operation; the fuel consumption and overall efficiency for intermittent fan operation and continuous operation are practically the same.

[*"Automatic Controls for Forced-Air Heating Systems," by S. Konzo and A. F. Hubbard, both of the Mechanical Engineering Department, University of Illinois. Paper presented at annual meeting, A.S.H.V.E., New York, February,* 1934*; approximately* 9000 *words,* 10 *charts,* 1 *diagram,* 1 *table.*]

●

Clothing and Wind

A theoretical discussion of the effect of clothing on the process of cooling the human body by conduction at constant temperature. The author has developed formulae expressing relationships between rate of cooling and wind velocity for clothed and unclothed bodies. The following conclusions are reached:

A given wind velocity cannot cause as great an increase in percentage rate of cooling on clothed bodies as on naked bodies.

If overall coefficient of conduction of clothing is less than the air film coefficient for still air, no increase in velocity of air can cause as large an increase in cooling rate as removal of clothing.

If clothing coefficient is greater than air film coefficient for still air, greater cooling is effected by increasing air velocity than by removing clothing.

Under fixed condition of clothing and wind velocity, rate of cooling of either clothed or naked bodies is directly proportional to difference between the temperature of the body and the dry-bulb temperature.

[*"The Effect of Clothing on the Rate of Cooling of the Body," by Walter S. Weeks, Department of Mining and Metallurgy, University of California, Berkeley. Published in Journal of Industrial Hygiene, September,* 1933; *approximately* 1000 *words.*]

●

Presentation of Technical Data

Engineers concerned with the presentation of statistical data for the interpretation of research, testing, or other engineering experimental work, will find the new A.S.T.M. manual on "Presentation of Data" of considerable value. Sponsored by the Committee on Methods of Testing, the manual discusses grouped and ungrouped frequency distributions, useful functions of frequency distributions, computation of standard deviations, and similar information.

The Appendix contains tables of squares and square roots from 1 to 2000.

[1933 *A.S.T.M. manual on "Presentation of Data," published by the American Society for Testing Materials, Philadelphia, Pa. Paper-bound;* 6 *in.* × 9 *in.;* 45 *pages; price,* 50*c.*]

●

Oil vs. Gas for Heating

This paper presents data obtained from tests conducted at the laboratory of the Department of Mechanical Engineering, Yale University, New Haven. The paper includes a comparison of two oil burners and a gas burner installed and tested in the same heating boiler, and presents specific examples of the effect of excess air upon burner capacity and boiler efficiency and output.

The oil burners were commercial products, one being of the luminous-flame type and the other of the vaporizing blue-flame type. The burners were installed so that the flame positions were somewhat similar. Curves are included to show that the two types of oil burner operated at practically the same efficiencies over a wide range of boiler outputs, whereas the gas burner showed an advantage in efficiency, especially at the lower outputs. The burners were operated continuously at uniform fuel-burning rates for this part of the investigation. When operated intermittently, the gas burner showed substantially the same efficiencies as the oil burners.

Further curves show the performance of the burners with various excess air percentages, and heat balances for the burners at various fuel rates and excess air percentages are tabulated.

[*"Comparison of Oil and Gas Firing in a Heating Boiler," by L. E. Seeley and E. J. Tavanlar, Department of Mechanical Engineering, Yale University, New Haven. A paper of cooperative research program of A.O.B.A., A.S.H.V.E., and Yale School of Engineering; presented at A.O.B.A. meeting, Chicago, June,* 1933; *approximately* 2000 *words; charts; tables.*]

BUSINESS BRIEFS

Now that 1933 has closed and the December building figures† are in, encouragement is found in an analysis of the figures for the last few months of the year. These can be summarized as follows:

Contracts

(a) The trend of building contracts for the past three months has been up for all classes of building excepting Commercial.

(b) Total building contracts for December were nearly $74 million, larger than any month since June —a month when building is usually up. When this is adjusted for seasonal trend, total building in December was 24% of the 1929 average—higher than any month since December, 1931; or, in other terms, new building construction is now higher than any time since the end of 1931 (see graph, page 49).

(c) Contracts for Educational buildings were $16 million in December—greater than any month since September, 1931.

(d) Contracts for Hospitals and Institutions in December were nearly double those of November.

(e) Contracts for Public buildings in December were more than double those of November.

(f) Commercial building contracts in December were off about 4% from November.

(g) Religious building contracts in December were about 67% above November, but about 50% off from October.

(h) Contracts for Social and Recreational buildings in December were more than double those of November.

(i) Although contracts for One and Two-Family Dwellings declined 30% in December from November, contracts for Apartments, Housing Developments and Dormitories rose 23%.

(j) Privately-financed contracts let during December were higher than for any month since April, 1932, with but four exceptions during the summer of 1933.

†As reported by F. W. Dodge Corporation for 37 states.

Contemplated Work

(a) Contemplated Work reported in December amounted to $73.9 million, double that reported in December, 1933, and almost 50% more than that in November, 1933.

(b) There is a startling increase in contemplated Educational buildings reported in the last quarter of 1933 as compared with 1932.

(c) The increase in contemplated work over 1932 is reflected in all the five major classes — Commercial, Educational, Semi-Public, Public, and Residential.

(d) The volume of contemplated Non-Residential work reported in December exceeded any month in the last three and one-half years (excepting for the one month of March, 1931).

Contracts for a municipal auditorium at Kansas City, $4.3 million, and for a state hospital at Manteno, Ill., $1 million, brought the public building award total for the week ending Jan. 1 to $6.9 million, a figure surpassed only twice last year.

The Timken Silent Automatic Company, as a result of improved business conditions, announced on Jan. 8 an average reduction of 17% in retail prices of its oil burners.

Deliveries of range oil, furnace oil, and the domestic heating grades of fuel oil, as reported to the U. S. Bureau of Mines by petroleum refiners, all show substantial increases in 1932 compared with 1931. The demand for range oil increased 50.4%, or from 4.5 million bbl. in 1931 to 6.8 million bbl. in 1932. Oil companies reported deliveries of 17.2 million bbl. of furnace oil in 1932, or 19.7% above the 1931 requirements of 14.4 million bbl. The market for light fuel oils used in domestic heating increased 15.1%, or from 10.4 million bbl. in 1931 to 12 million bbl. in 1932.

Employment in New York State manufacturing plants making heating equipment increased from 28.7 in October to 30.0 in November. The figures are in percentage of the 1925-27 average. Employment by heating and piping contractors in the same state showed an increase, amount not reported, in November.

The State of New York has begun a legislative program to prepare the way for the elimination of racketeering contractors who have been resorting to the "kick-back" system.

In heating manufacturing plants throughout the whole country, employment showed an increase from 44.6 in October to 45.4 in November, the figures being in per cent of 1926 average.

One-fourth of New York's domiciles are heated by stoves, 68.6% by steam, 4% by warm air, and 2.7% by hot water, according to a recent survey by R. L. Polk & Company. Nearly 53% of the families live in apartments.

According to A. C. Joy, publicity manager of the Pacific Gas Electric Company, that company has made a remarkable record in selling and helping dealers sell gas-heating equipment the last few years. The numbers of these units sold were:

Year	Gas Conversions	Gas Boilers and Furnaces	Gas Radiators
1930	12,331	4,887	....
1931	9,056	8,159	1,208
1932	6,311	7,895	1,085
1933 (11 mo.)	2,800	6,100	....

Minneapolis-Honeywell Regulator Company has declared an extra dividend of 25 cents and the regular quarterly dividend of 25 cents on the common stock.

Employment in plants manufacturing heating apparatus decreased in December to 43.8 from 45.4% in November. Percentages are of the 1926 average. Payrolls rose from 27.8 to 27.9, indicating an increase in average wages.

Wholesale prices of heating equipment dropped from 73.7 to 72.5% of the 1926 average, the figures being the November and December percentages, respectively. Prices of all building materials reversed the usual trend and rose from 84.9 to 85.6.

RESOURCES of the Home Loan Bank were $2.6 billion, the Federal Home Loan Bank Board announced January 21. These resources were in the 2,065 members of the system and amounted to 34% of the entire assets of all building and loan associations in the United States, as contrasted with less than 3% at the end of 1932 when only 116 institutions were members of the system.

The Board issued a statement which said, among other things:

"The American urban home mortgage debt aggregates over $21,000,000,000. That field of finance must be restored to strength and activity, not only in the interest of homeowners and financial institutions, but likewise as the most essential step in recovery and permanent prosperity for the building trades and construction industries, upon which American economic welfare so largely depends. The Federal Government in creating the Federal Home Loan Bank System, and in subscribing $124,700,000 to the stock of the regional banks, has primed the pump for the return of large amounts of private capital to home loan finance."

REGISTRATION for the selling of securities of the Refrigerating Research Corporation of Brooklyn was announced by the Federal Trade Commission, January 19. These issues may be sold to the public 20 days after filing, unless subject to a Commission stock order. The corporation proposes to contract for, supply, and design air conditioning, refrigerating, and heating systems, issuing $250,000 worth of common stock for corporation purposes. Donald B. King is president, and Lester Bilion, secretary.

ROLLAND J. HAMILTON, president, American Radiator Company, writing in the January issue of *Executives Service Bulletin,* points out the difficulties encountered in attempts to apply open price policies to the buying and selling operations of manufacturers and wholesalers. He indicates the enormous waste of time and money in the continued effort to ascertain lowest prices, and concludes that application of open price selling in industry, similar to that in retail trade, particularly department stores, would be a tremendous step forward in price stabilization and elimination of unfair trade practices.

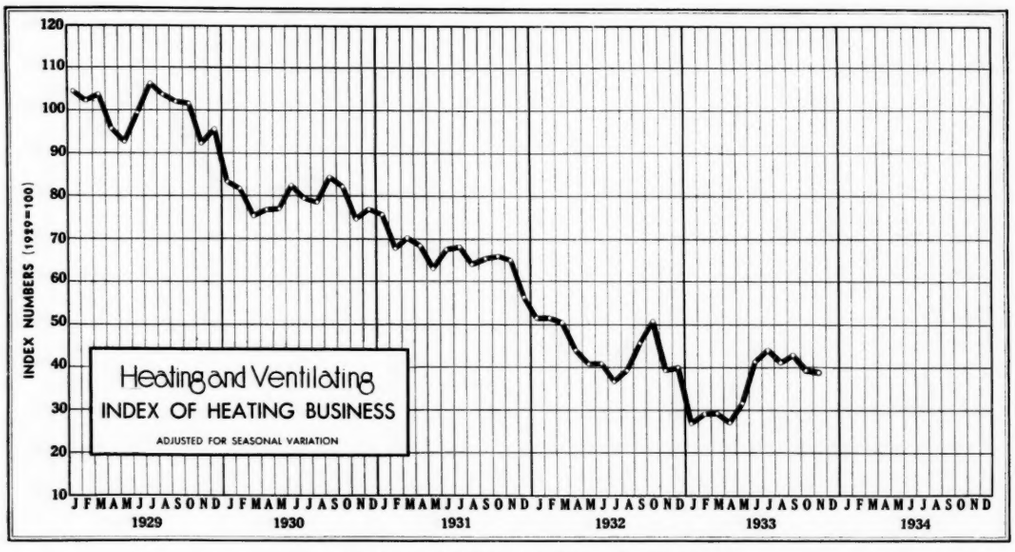
THE Real Property Census now under way under the direction of the CWA is more far-reaching than is commonly known. It will be an inventory of every structure in the territory surveyed, and will tabulate the material of construction, size, year built, condition, type of heating apparatus, fuel used, and other items totaling over 30 in number. The enumerators will ask whether the heating plant is warm air, steam or vapor, water, stove, or other type, or record the absence of a system. The reports are due in Washington about February 15.

HIRAM WALKER & SONS, INC., 75-year old distilling firm, is building in Peoria, Ill., the largest distillery ever built in the world. The plant, representing an investment of over $4 million, will use 6 million bushels of grain per year, 350 tons of coal per day.

A BRITISH firm, Turner & Newall Ltd., has acquired the controlling interest in a new asbestos fabricating company formed by the consolidation of the Keasbey & Mattison Company and the Ambler Asbestos Shingle & Sheathing Company, both of Ambler, Pa.

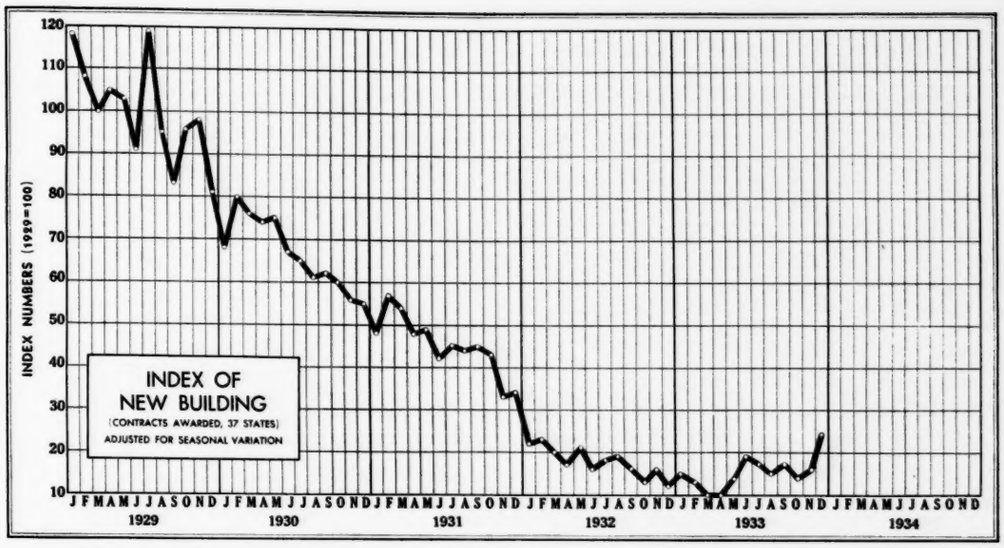
MORE than 40 million tons of steel will be manufactured in 1934, according to present expectations, L. S. Hamaker, sales promotion manager of the Republic Steel Corporation, told members of the Mahoning Valley Foremen's Club in January. He said production in 1933 was 25 million tons.

SINCE the enactment of the National Industrial Recovery Act, the number of companies that deal with their workers through employee-representation plans has increased 180%, and the number of companies that have trade union agreements with their employees has increased 75%, according to the results of a nation-wide survey of employer-employee relations in manufacturing and mining industries conducted by the National Industrial Conference Board.


INDEX NUMBERS (1929=100)
120
110
100
90
80
70
60
50
40
30
20
10
Heating and Ventilating
INDEX OF HEATING BUSINESS
ADJUSTED FOR SEASONAL VARIATION
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1929
1930
1931
1932
1933
1934

HEATING INDEX DOWN SLIGHTLY

Activity in the heating industry, as indicated by HEATING AND VENTILATING'S Index of Heating Business, declined from 39.6 in October to 39.0 in November. The figures are in per cent of 1929 average. Comparison of the index with other months follows: November, 1933—39.0; October, 1933—39.6; November, 1932—39.5.


INDEX NUMBERS (1929=100)
120
110
100
90
80
70
60
50
40
30
20
10
INDEX OF
NEW BUILDING
(CONTRACTS AWARDED, 37 STATES)
ADJUSTED FOR SEASONAL VARIATION
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1929
1930
1931
1932
1933
1934

Building contracts awarded, as reported by the F. W. Dodge Corp. for 37 states, when adjusted for seasonal variation showed a sharp pick-up in December. The Index, shown above, rose to 24% of the 1929 average, while the November index was 16. In addition, the Index of Automatic Heating compiled by HEATING AND VENTILATING rose 50.8 in October to 54.5 in November, the index being in per cent of 1929 average. The rise was caused altogether by oil burner shipments, which fell much less than the usual seasonal decline, while gas and stoker equipment fell slightly more than seasonally, resulting in an increase in the index. Comparative figures for this index are: November, 1933—54.5; October, 1933—50.8; September, 1933—63.5.

BUILDERS no longer fear winter, according to A. J. Boase, structural bureau of the Portland Cement Association. Out of 100 days of winter, Mr. Boase says, only 15 days are too cold for builders to work.

"That winter construction is practicable is amply proved," he said, "by the fact that two of the world's larger buildings, the Furniture Mart and the Merchandise Mart, in Chicago, were largely built in winter. Hundreds of structures of all kinds, including many high apartment buildings, have been built successfully in the cold months in the Northern states and in Canada."

HOME repair and modernizing may be actively backed by the Federal government. President Roosevelt instructed the Federal Home Loan Bank Board January 23 to draw up recommendations to be submitted to Congress enlarging the authorization of the Home Loan Bank System to permit loans to homeowners for the rehabilitation and modernization of dwellings.

The board will report on this topic to the President at the same time it presents its recommendations for carrying out his previously announced intention to put a Treasury guarantee behind the proposed $2,000,000,000 issue of home loan bonds, to be exchanged for mortgages on homes.

Under its present authorization the Home Loan Board, through the 12 Home Loan Banks, may refinance mortgages and lend money to modernize houses on which the banks hold the mortgages.

The new project was said by Mr. Fahey to provide for loans to homeowners who have no mortgages on their houses or whose mortgages are held by normal investors.

No direct loans would be made by the Home Loan Banks, but these would advance funds for such loans to the 2,500 building and loan associations and saving banks which are members of the Home Loan Banks.

THE U. S. Steel Corporation shipped 600,639 tons of finished steel in December, 170,281 more than the 430,358 in November, according to figures given out in January. This compares with 227,576 tons in the same month last year and constitutes not only the largest December business since 1929 but the first time in many years that the trend has been upward in the final month of the year.

For the full year, furthermore, shipments rose for the first time since 1929.

POSSIBILITY that the Bayonne, N. J., plant of the American Radiator Company might be reopened some time this spring was indicated in January in a statement from the president, Rolland J. Hamilton. The announcement said:

"The Bayonne, N. J., plant of the American Radiator Company has been closed some months. Certain city officials of Bayonne and a committee of workmen have solicited the good offices of the National Labor Board at Washington to take up with the company the matter of reopening the plant.

"A meeting to this end is being held this morning and the company has expressed the hope that the condition of the building industry will be such that the plant can be opened some time this spring."

THE Youngstown Sheet & Tube Company is planning to start soon to expand its electric weld mill at the Brier Hill plant to include production of small size pipe, according to Frank Purnell, president.

Immediate expenditures on the expansion will total approximately $500,000, Mr. Purnell said. This is considered the start of enlargement plans which are estimated to call for a total outlay of $1,500,000 for new processes and equipment. The Brier Hill pipe mill now manufactures electric weld pipe in sizes from 18 to 26 in. The new extension will permit manufacture of pipe from 16 in. down to 8 in. and intermediate sizes. This will give the company a range in size of electric weld pipe from 8 in. to 26 in.

WILLIAMS Oil-O-Matic made a profit of $49,585 in 1933 as compared with $19,609 in 1932. Sales increased 27½%.

News of the Month

Industry Ready for Show and Meeting

Members of the heating, ventilating, and air conditioning fraternity from all parts of the country are assembling in New York for the industry's most important events—the Third International Heating and Ventilating Exposition, at Grand Central Palace, and the 40th annual meeting of the American Society of Heating and Ventilating Engineers at the Biltmore Hotel, both to be held simultaneously February 5-9.

Equipment and auxiliaries of wide variety, many of them representing entirely new developments and refinements in the art, will be on display at the show, affording to engineers and laymen alike a splendid opportunity to inform themselves on the progress of the industry during the past two years. There will be approximately 140 exhibitors, whose products will encompass combustion apparatus, steam heating equipment, ventilating and air conditioning apparatus, control appliances, district heating equipment, insulating materials, and electrical equipment and specialties.

An attractive schedule of technical papers has been prepared for the society's meeting. The opening session, Monday, February 5, at 2 p.m., will hear "Automatic Controls for Forced-Air Heating Systems," by Konzo and Hubbard; "Heating Buildings with Hot Water," by Burt and Lewis, and a report of the Committee on the Code for Testing and Rating Condensation and Vacuum Pumps.

At the second session, Tuesday morning at 9:30, the report of the Committee on Research will be heard in addition to the following technical papers: "Construction and Equipment of the Pierce Laboratory," by Professor Winslow; "Selecting Temperatures and Wind Velocities for Calculating Heating Losses," by Paul Close; "Radiation of Energy through Glass," by Blackshaw and Houghten, and "Studies of Solar Radiation through Bare and Shaded Windows," by Houghten, Gutberlet, and Blackshaw. At the afternoon session, commencing at 2 p.m., the following papers are to be heard: "A Proving Home for Air Conditioning Investigations," by Harrington; "Low-Cost Air Conditioning for a Small Residence," by Drewry; "Comfort Cooling with Attic Ventilating Fans," by Helmrich and Tuttle, and "Study of Summer Cooling in the Research Residence during the Summer of 1933," by Kratz and Konzo.

The fourth session, Wednesday morning, will include "Thermodynamic Properties of Moist Air," by Professor Goff; "Study of Air Conditioning and Office Employees' Efficiency," by McConnell and Kagey, and "Observations of Hay Fever Sufferers in Air Conditioned Room and the Relationship between the Pollen Content of Outdoor Air and Weather Conditions," by Kendall and Weidner. Doctor Mills' paper, "Air Conditioning in Its Relation to Human Welfare", "Engineering in the Hospital of Tomorrow," by Neergaard, and "Diurnal and Seasonal Variations in the Small-Ion Content of Outdoor and Indoor Air," by Yaglou and Benjamin, are scheduled for the Wednesday afternoon session.

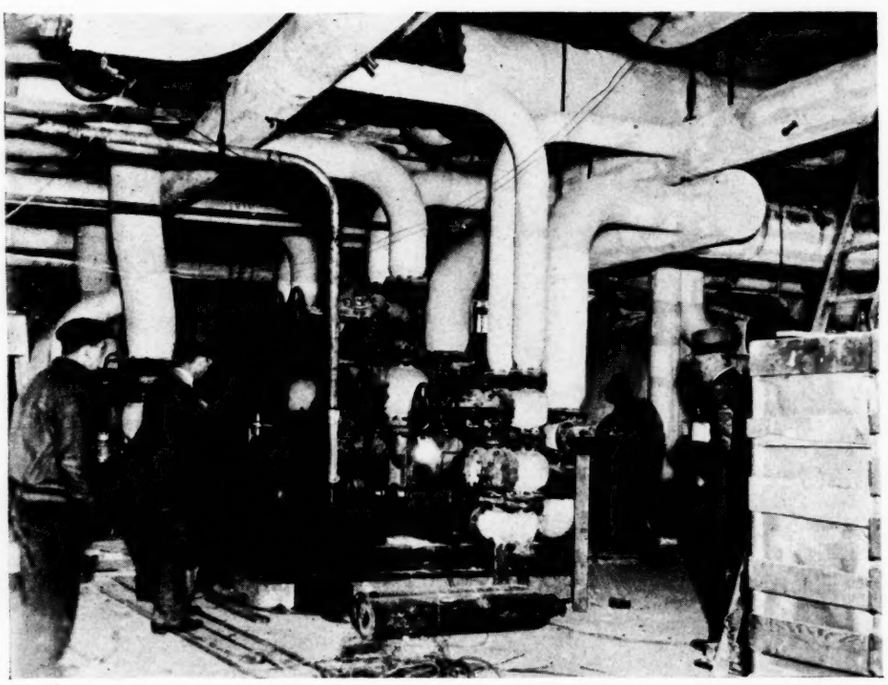
"Study of Fuel-Burning Rates and Power Requirements of Oil Burners in Relation to Excess Air," by Seeley and Tavanlar, and "Design and Valuation of Cast-Iron Domestic Heating Boilers," by Doctor Brabbée, will be presented at the final technical session, Thursday afternoon, at 2 p.m.

Following is a partial list of manufacturers who have exhibits at the exposition, together with the number of the booth at which they will be found:

Aerofin Corp. 125
Air Conditioning Industries, Inc.... 49
Air Controls Inc. 10
Allis-Chalmers Mfg. Co. 129
American Brass Co. 45
American Gas Products Corp. 36
American Radiator Co... 36-37-38-40-41
Anderson Manufacturing Co. 5
Armstrong Machine Works 72
Automatic Products Co. 103

Barber-Colman Co. 19-20
Baker Ice Machine Co., Inc. 122
Barnes & Jones, Inc. 67
Bell & Gossett Co. 78
Blom-Gamarra Humidifier 98
Breuer Electric Mfg. Co. 12
Bristol Co. 117
Bryant Heater Co. 34-35
Burnham Boiler Corp. 28-29

Caloroil Burner Corp. 30
Campbell Metal Window Corp..... 37
Carrier Engineering Corp. 124
Century Electric Co. 76



International News

Pump room in the power plant which supplies heat to 55 Government buildings in Washington, said to be the largest central heating plant in the world. Seven miles of connecting pipe are installed in the plant, which was first operated for test purposes during January.

Century Engineering Corp. 85-86
Chace, W. M., Valve Co. 75
Chase Brass & Copper Co., Inc.... 55
Cleveland Heater Co. 10
Comfortaire Co. 126
Coppus Engineering Corp. 81
Crane Co. 51

Detroit Lubricator Co. 38
Dole Valve Co. 77

Eagle-Picher Lead Co. 21
Economy Pumping Machinery Co... 89
Emerson Electric Mfg. Co. 92
Excelso Products Corp. 40

Fairbanks Co. 26
Fairfield Oil Heating Co., Inc.....107
Fitzgibbons Boiler Co. 59
Fox Furnace Co. .....36 and 41
Frick Co. 133-134
Friez, Julien P., & Sons Inc. 74
Frigidaire Corp. 32-33

General Electric Co.
(Air Conditioning Div.) 69
General Electric Co.
(Oil Burner Div.) 111
General Gas Light Co. 23

Hart & Cooley Mfg. Co. 100
HEATING AND VENTILATING..... 71
Heil Co. 108
Hinrichsen, A. F., Inc. 126
Hoffman Specialty Co., Inc. 89
Holtzer-Cabot Electric Co. 132
Hotstream Heater Co. 87

Independent Register & Mfg. Co... 91
Iron Fireman Mfg. Co. 3-4

Jenkins Bros. 16
Jones & Laughlin Steel Corp. 62

Kainer & Co. 101
Kelly, John G., Inc. 88
Kewanee Boiler Corp. 41
Knickerbocker Ice Co. 118
Koven, L. O., & Brother, Inc. 6

Liquidometer Corp. 136

McDonnell & Miller 139
Malleable Iron Fittings Co. 114
May Oil Burner Corp. 58
Mayflower Oil Burner Co. 140
Mercoid Corporation 64
Minneapolis-Honeywell
Regulator Co. 65-66
Modine Mfg. Co. 24
Monarch Manufacturing Works,
Inc. 135
Moore, J. W., Valve Corp. 5
Motometer Gauge & Equip. Corp...121
Motorstokor Corp. 61
Mueller, L. V., Furnace Co. 25

Niagara Blower Co. 127-128
Norristown Magnesia & Asbestos
Co. 70
Nu-Type Submerged Water Heater
Corp. 11

Orr & Sembower Inc. 110
Owens-Illinois Glass Co. 43

Paragon Oil Co. 119
Parker Appliance Co. 130
Penn Electric Switch Co. 48
Petroleum Heat & Power Co. 112

Republic Steel Corp. 57
Reynolds Metals Inc. 18
Rhoads, J. E., & Sons 99
Richardson & Boynton Co. 52
Richmond Radiator Co. 15
Russell, W. A., & Co., Inc. 8

Sarco Co. Inc. 131
Scott-Newcomb Inc. 46
Silent Glow Oil Burner Corp. 30

Dan Reinhardsen, newly appointed manager of the Spencer Heater Company's New York office. Mr. Reinhardsen has been associated with this office for the past 12 years.

Skidmore Corp. 73
Spencer Heater Co. 50
Steel & Tubes Inc. 57
Strang Air Conditioning Corp. 80

Taco Heaters Inc. 113
Taylor Instrument Companies 123
Thatcher Co. 63
Thrush, H. A., & Co. 17
Tuttle & Bailey Inc. 100

Uni-Flo Grille Corp. 95-96
United States Radiator Corp. 44

Vinco Co., Inc. 22
Volcano Burner Corp. 111-A

Waterloo Register Co. 102
Watts Regulator Co. 88
Warren Webster & Company 39
Weil-McLain Company 42
Westinghouse Electric & Mfg. Co.. 90
Whitty Manufacturing Co. Inc. ... 84
Wing, L. J., Mfg. Co. 93-94
Wickwire Spencer Steel Co. 79
Wizard Oil Burner Co. 140
Wood Hydraulic Hoist & Body Co. 54

York Ice Machinery Co. 53
York Oil Burner Co., Inc. 82-83
Young Radiator Co. 27
Youngstown Sheet & Tube Co. 68

National Radiator Appoints Titzell

National Radiator Corp., Johnstown, Pa., has appointed J. Edgar Titzell a member of its New York sales organization in charge of steel boiler sales promotion.

N. Y. Chapter Hears Naval Officer

An illustrated talk "Heating and Ventilation of Naval Vessels," by Capt. C. M. Simmers, Construction Officer, U. S. Navy Yard, Brooklyn, was presented before the meeting of

News of the Month

the New York chapter, A.S.H.V.E., held January 15 at the Building Trades Club. Captain Simmers described the problems encountered in laying out ductwork in the restricted space on shipboard, and described the use of metal foil insulation on Navy vessels.

A resolution expressing the chapter's approval of the work done by the CWA on employment in the Metropolitan area, and two proposed modifications requiring that engineers employed on engineering work be paid at rates not less than those paid to skilled labor, and that, where labor and materials are used in building, the existing organization of the construction industry be used, were placed before the chapter by John G. Eadie. After considerable discussion, a motion to adopt the resolution was defeated.

Lockwood Greene Moves

Lockwood Greene Engineers, Inc., has moved from 100 East 42nd Street to the RCA Building in Rockefeller Center, New York.

Oil Burner Salesmen Rewarded

Star salesmen of various oil burner companies are being rewarded by winter vacations in Bermuda for exceeding their sales quotas. Timken Silent Automatic Company sends 125 salesmen on the "Queen of Bermuda" January 6. These men belong to the company's Annual Quota Club.

Also sailing on the same liner were 20 distributors of the May Oil Burner Company. Another party of 30 Electrol Oil Burner Company salesmen left on the same boat from New York January 15.

On January 20, a hundred salesmen of General Electric's air conditioning division left on the "Monarch of Bermuda."

Mills in Charge at Rome

D. L. Mills was assigned to take active charge of Rome Radiation Division of Revere Copper and

News of the Month

Brass Inc., Rome, N. Y., effective December 1. Maurice G. Steele, previously in charge of this division, has been transferred to another division of Revere as products engineer.

Mr. Mills, who has been engaged in the development and sales of Revere convectors, was formerly connected with the Safety Car Heating & Lighting Company and the American Radiator Company.

Contractors Hold Code Meeting

At a special meeting of the Heating, Piping and Air Conditioning Contractors National Association, held January 8 at the Ambassador Hotel, Atlantic City, the by-laws were amended to terminate all directorships at the next annual meeting and to provide for the election of a new board at that time. This action was taken in order that new members, who have become affiliated with the association since the enactment of the NIRA, may have an opportunity to vote for the entire Board of Directors rather than for one-third only. Other amendments related to the procedure of election to membership and termination of membership in the national association and its local affiliates.

It was further decided at the meeting to recommend to the Code Authority that the country be organized under regional and state administrative committees, appointed from nominations made by state and local associations. Other actions taken at the meeting recommended immediate selection of the various committees and local compliance boards.

An announcement of the association states that copies of the "Standard Manual on Pipe Welding," and "Air Conditioning for Heating Contractors," published by the association, are now available at $2.50 each. This material formerly sold at $5 per copy.

COMING EVENTS

FEBRUARY 5-8, 1934. Fortieth Annual Meeting of the American Society of Heating and Ventilating Engineers, to be held in New York. Headquarters at the Hotel Biltmore.

FEBRUARY 5-9, 1934. Third International Heating and Ventilating Exposition, to be held in the Grand Central Palace, New York.

MARCH 5-9, 1934. Eleventh Annual Convention and Show of the American Oil Burner Association, to be held in Philadelphia. Exhibition and Convention Hall of the Commercial Museum to be the show site; Hotel Benjamin Franklin to be hotel headquarters.

JUNE 12-15, 1934. Twenty-Fifth Annual Convention of the National District Heating Association, to be held in Rochester, N. Y.

JUNE 19-22, 1934. Twenty-Eighth Annual Convention of the Smoke Prevention Association, to be held in Buffalo. Headquarters at the Hotel Statler.

JUNE, 1934. Fifty-Second Annual Convention and Exposition of the National Association of Master Plumbers, to be held in Washington, D. C.

JUNE, 1934. Spring Meeting of the American Society of Refrigerating Engineers, to be held in Skytop, Pa. Headquarters at the Hotel Skytop.

Martin to Lecture

George W. Martin, supervising engineer of the U. S. Realty & Improvement Co., New York, will give six lectures on engineering problems in connection with building management. The lectures are part of a Spring course beginning February 7 at Columbia University, Department of Business.

Buyers Appoints Durkee

A. M. Byers Co., Pittsburgh, announces the appointment of J. B. Durkee as manager of its Houston office. Mr. Durkee succeeds H. B. Weathersby who died December 19, 1933.

Sawade Sales Manager at Utica

Carl A. Sawade has been appointed general manager of sales of the Utica Radiator Corp., Utica, N. Y. Connected with the heating industry for the past 20 years, Mr. Sawade was recently vice-president and general manager of the Lincoln-Niagara Corporation. Prior to that time he was assistant general manager of sales of the National Radiator Corporation.

Duluth May Expand Central Heating

The city of Duluth is preparing plans for a municipal steam heating project which will extend from the eastern end of the district now served by The Duluth Steam Corporation. It will include 20 miles of

Price Picture News

N. Y. World-Telegram

HE TALKS—SHE SQUAWKS—NOBODY PAYS

According to Emily Marx, young woman attorney, Judge Edward B. La Fetra of New York's City Court spent so much time complaining about the heating system in his court that she was fined $10 for exceeding the time limit on the case. The Judge, she said, went into great detail, explaining the pumps, the piping, and finally expressed the hope that the jurors would help remedy the archaic heating plant. Another court remitted the fine. P. S.—Nothing has been done about the heating system.

pipe lines, 3,000 buildings, and about 2¼ million square feet of radiation, according to Robert L. Fitzgerald, vice-president and general manager of the Duluth Steam Corporation.

"This project is being planned as a Public Works project in anticipation of federal funds for financing. If the project goes through it contemplates purchase of steam from The Duluth Steam Corporation for the first couple of years of operation or until such time as its load entirely absorbs the available capacity of the corporation. The load to be served is about one-third in business buildings, apartment houses and institutions, the balance strictly residential.

Walsh Leaves Timken

E. V. Walsh, for six years general sales manager and more recently vice-president in charge of sales of the Timken Silent Automatic Co., Detroit, resigned January 23.

Mr. Walsh has not announced his plans for the future.

Miller Promoted

Edmund W. Miller, for two years assistant manager of the Indianapolis branch of Crane Company, has been named manager of the branch effective January 16.

Mr. Miller succeeds R. A. MacGill who died December 29, 1933. H. R. Riggs has been named as assistant to Mr. Miller.

A. C. Course Planned for Chicago

A course in air conditioning and refrigeration is being planned by the Educational Committee of the Western Society of Engineers and a similar committee of the Chicago Section, American Institute of Electrical Engineers. The course will commence February 7 and continue through 10 weekly meetings.

The first part of each session is to be devoted to lecture and the remainder of the period will be occupied with laboratory demonstrations and computations. A $5 tuition fee will be charged. Those interested

25 Years Ago in

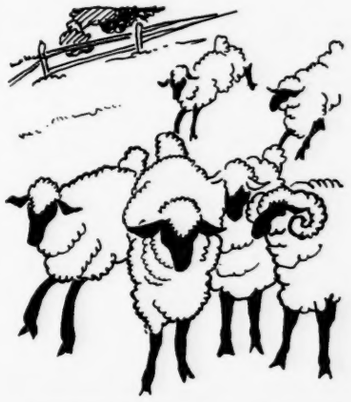
The Heating Ventilating Magazine

FEBRUARY, 1909

AMERICAN DISTRICT STEAM CO., Lockport, N. Y., elected the following officers at a recent meeting of the stockholders: president, William Wells; vice-president, G. C. St. John; secretary and general manager, Charles R. Bishop; treasurer, Robert Ham.

NYGREN, TENNEY & OHMES, New York, has been organized to continue the consulting heating and ventilating engineering practice of the late Alfred R. Wolff. The three members of the new firm were long associated with Mr. Wolff.

UNITED BUNCH OF SHEEP, an organization of heating and plumbing supply salesmen in Milwaukee, elected the following officers at its annual banquet: Grand Ram, David W. Johnson; Grand Vice-Ram, N. D. Garnsey; Chief Shearer, James Brady; Grand Keeper of the Fleece, L. M. Kornreich. A "fold" of the organization is soon to be installed in Chicago.



AMERICAN BLOWER CO., Detroit, has consolidated with the Sirocco Engineering Co., New York, manufacturer of fans and blowers. The business of both organizations will be carried on under the name of the American Blower Company, with main offices at Detroit. William C. Redfield, president of Sirocco, and Charles H. Gifford, formerly general manager, B. F. Sturtevant Company, have been elected vice-president and treasurer, respectively, of The American Blower Company.

NEW OFFICERS of the American Society of Heating and Ventilating Engineers, elected at the 15th annual meeting, New York, January 19-21, 1909, are as follows: president, William G. Snow, Boston; first vice-president, August Kehm, Chicago; second vice-president, Burt S. Harrison, New York; secretary, William M. Mackay, New York; treasurer, U. G. Scollay, Brooklyn.

AS A KEYNOTE for the future work of the A.S.H.V.E., William G. Snow, speaking at the society's annual dinner, January 20, 1909, proposed the following: "Let any commercial gain be a by-product of our campaign of education."

News of the Month

should notify the secretary of the Western Society of Engineers, 205 West Wacker Drive, Chicago.

Falk Represents Spencer in N. Y.

D. Falk, formerly manager of the service and repair department in the New York office of Spencer Heater Co., Williamsport, Pa., has been appointed sales representative of this company operating out of the New York office in Westchester and Putnam counties, N. Y., and Fairfield County, Conn.

N. Y. U. Heating Society Plans Dance

On February 10, the New York University Heating and Ventilating Engineers Society will hold its fifth annual dinner and dance at the Hotel Wentworth, New York. The society, composed of former students of the course in heating and ventilating engineering at the university, meets monthly to discuss the news of the industry, new equipment, and practices. All friends of the organization are invited to participate in the festivities.

Inland Steel Appoints Ryerson and Pidgeon-Thomas

Inland Steel Co., Chicago, announces that Joseph T. Ryerson & Son, Inc., has been appointed its exclusive selling agent for steel sheet piling in New England, Middle Atlantic states, Ohio, Kentucky and District of Columbia.

Pidgeon-Thomas Iron Co., Memphis, Tenn., has been appointed exclusive agent for steel sheet piling in Memphis and western Tennessee.

A. S. H. V. E. to Amend By-Laws

Among the business to be transacted at the annual meeting of the A.S.H.V.E. in New York, February 5-8, inclusive, will be additions and

changes proposed by the Committee on Constitutions and By-Laws. The first is an amendment to the rule requiring that $3 of the annual dues of members be considered as a subscription to the Journal of the Society, making it read "A sum equal to its current subscription price." The rule requiring that a certified public accountant selected by the council at its last meeting in the calendar year will be amended to read simply that the C.P.A. shall be selected by the council.

Herske New V. P. of American Radiator

Arthur R. Herske, for the past three years sales promotion manager of the American Radiator and Standard Sanitary Corp., New York, has been appointed vice-president and general manager of sales of the American Radiator Company. Before his connection with American Radiator, Mr. Herske held the position of secretary-manager of the Heating and Piping Contractors Cleveland Association for three years, increasing the membership of the association from 9 to 120 contractors in four weeks after assuming office.

Prior to this connection Mr. Herske was superintendent of power for Willard Storage Battery Co., Cleveland, and while in that position established radio station WTAM, Cleveland, now one of the largest radio stations in the United States.

Arthur R. Herske, newly appointed vice-president and general manager of sales of American Radiator Company.

New Name for Barstow

E. M. Gilbert Engineering Corporation is the new name of W. S. Barstow and Co., Inc., 412 Washington St., Reading, Pa. The company was incorporated in 1906 to function as a centralized engineering, construction, and management organization for various utility companies, and has for many years acted in a general consulting capacity in a wide variety of construction and operating problems in both the utility and industrial fields. The new name was adopted to identify the corporation with its president.

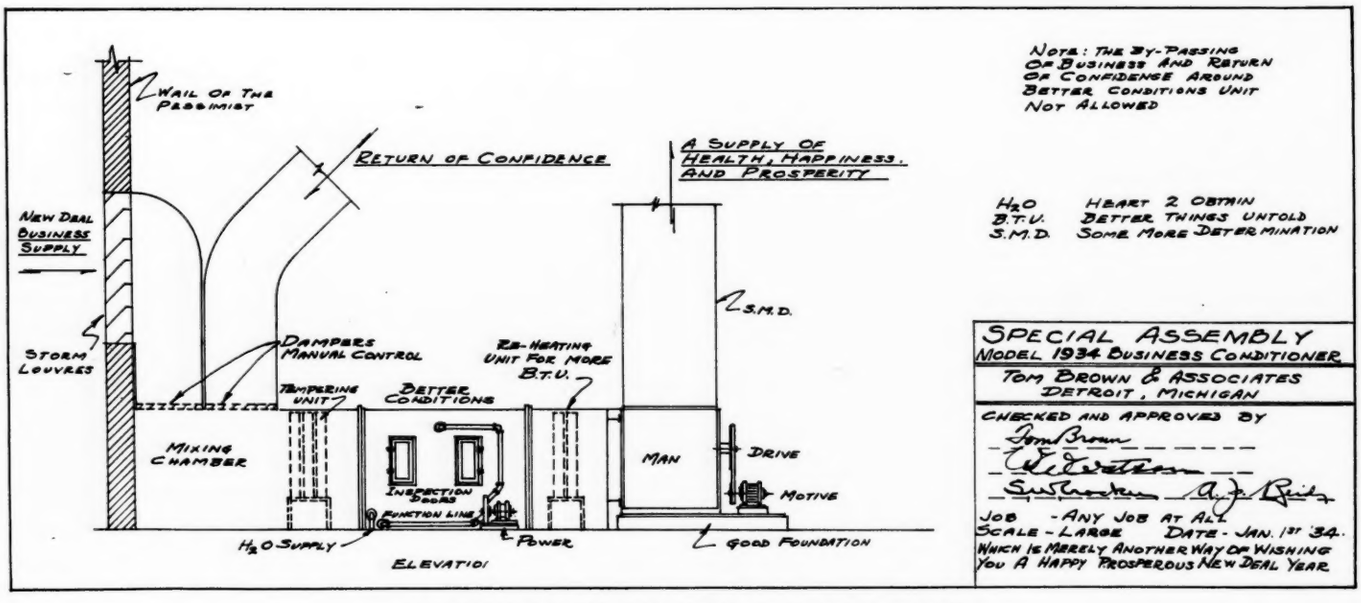
Seabury Representing Marsh

Jas. P. Marsh Corp., Chicago, announces the appointment of Richmond Seabury, 1 Orchard St., Wellesley Hills, Mass., as sales representative.

Lakeside Conducts Conditioning Institute

Lakeside Company, Hermansville, Mich., maker of Furblo furnace blowers and Fairweather air conditioners, has inaugurated the Furblo Institute of Mechanical Heating and Air Conditioning, a cooperative association to provide engineering and merchandising instruction for heating contractors.

Guy A. Voorhees, consulting engineer, Indianapolis, will supervise preparation of the engineering lessons and bulletins, which will be forwarded to institute membership twice each month. These lessons will be based on and built around the mechanical heating code of the National Warm Air Heating and Air Conditioning Association. Sales and advertising bulletins, also issued



AN ENGINEER SENDS NEW YEAR GREETINGS

Reproduction of a New Year card sent by Tom Brown and his associates, air conditioning engineers of Detroit, to their business friends.

twice a month, will be prepared under the direction of Jesse Gorov, president, Jesse Gorov, Inc., Chicago, and I. W. Rowell, manager of Lakeside Company, and director of the institute.

Members will be requested to submit interesting engineering and sales experiences for the benefit of other institute members. Contractors enrolled in the institute are invited to use liberally the consulting and advisory service of the association.

Kleine Heads Heating Industries Committee

Edward B. Kleine, Cincinnati, has been appointed chairman of the Plumbing and Heating Industries Committee, National Association of Master Plumbers, according to an announcement by Robert J. Barrett, president. Serving with Mr. Kleine on the committee are: Robert J. Barrett, John J. Calnan, and P. W. Donoghue.

Francis Purchases AmPeCo

American Machine Products Co., Marshalltown, Iowa, manufacturing AmPeCo blowers and air washers, has been purchased by E. A. Francis, formerly president of the organization. Mr. Francis is returning to the post of president of the company after an absence of several years.

Book on Pipe Threading

Pipe threading principles are fully covered in a 20-page standard size bulletin recently published by the National Tube Co., subsidiary of the U. S. Steel Corporation, Pittsburgh, Pa. Lip and cutting angles, lead, chip space clearance, care and repair of dies, and pipe thread standards are adequately covered.

Mont H. Smith

Mont H. Smith, author of "The Furnace Man's Handbook," died January 18 at the age of 82. Retired from active business in 1927, Mr. Smith was for many years associated with The International Heater Company as manager of its Philadelphia branch. He is survived by his widow and one son.

John J. Vogelpohl

John J. Vogelpohl, formerly vice-president of the National Association of Master Plumbers, died January 17 in Miami, Fla., following an appendix operation.

Mr. Vogelpohl was very active in N.A.M.P. affairs and served on various committees and as a director from 1925-1928.

NEW CATALOGS

Dearborn Chemical Co., 310 South Michigan Ave., Chicago, has issued a bulletin describing applications of No-Ox-Id rust preventive in the railroad field. Other uses are described; standard size, 24 pages.

Erskine Radiator Div., Chase Brass & Copper Co., Inc., Waterbury, Conn., has issued a catalog describing and illustrating its line of copper radiators and enclosures. Architectural and engineering data are included. Also describes Erskine copper water heaters, and Chase copper tubing and sweat fittings; standard size, 23 pages.

Haynes Stellite Co., Kokomo, Ind., Unit of Union Carbide and Carbon Corp., has issued a bulletin, "Hard-Facing with Haynes Stellite Products," describing the products, processes, and various applications.

News of the Month

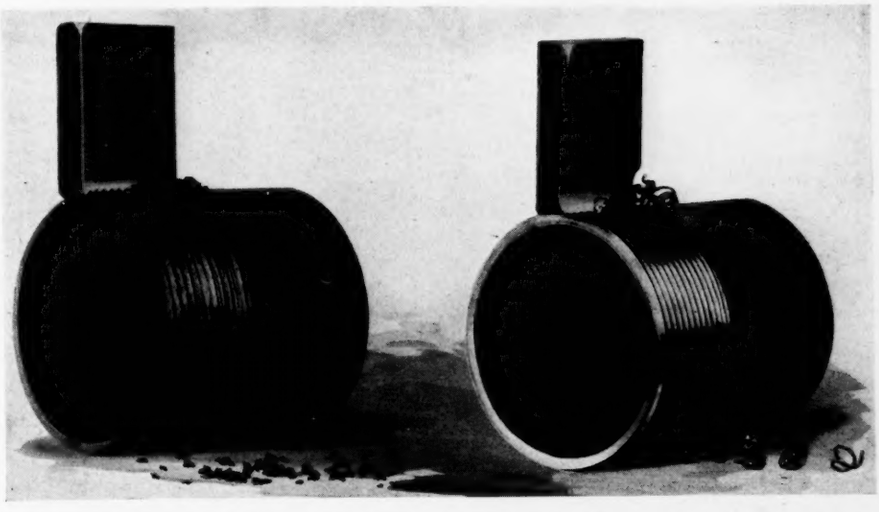
Among the uses noted are the hard-surfacing of boiler feed pump valves, and of valve needles and nozzles; illustrated, standard size, 95 pages.

The Hobart Brothers Co., Troy, Ohio, has issued Bulletin No. D-7, containing detailed instructions for welding ordinary copper to copper, or copper to steel by the Hobart "Long Arc" method; 12 pages; 4¼ in. by 7¼ in.; illustrated.

Nason Manufacturing Co., 71 Fulton St., New York, has published a 20-page catalog describing its complete line of steam traps and other specialties. Includes return, vacuum, combination, and separating traps of bucket and ball float types; 20 pages, illustrated.

Republic Flow Meters Co., 2240 Diversey Parkway, Chicago, has issued catalog No. 700 describing the principle of electric resistance flow measurement. The principle of the cartridge-sealed element is completely described and illustrated. Written for engineers; standard size, 24 pages.

Republic Steel Corp., Youngstown, Ohio, has issued Bulletin 124, containing information on architectural applications of Enduro stainless steel. Fabrication, properties, shapes, and finishes available, are covered; standard size, 13 pages.



The view at the left shows rough-pipe threads cut with an improperly ground die. Note the crumbling chips in contrast with those in the view at the right, which illustrates a properly ground die. Note also the characteristic spiral chips made with a correctly ground die method. Illustrations are from the National Tube Company's Bulletin No. 6, "Pipe Threading Principles."

New Equipment

Modine Exhibits Unit Heaters

A new line of copper fin-tube unit heaters for steam and hot water, by Modine Manufacturing Co., Heating Div., Racine, Wis., is on display at the Heating and Ventilating Exposition.

Heating element is constructed entirely of copper or copper alloy, welded or brazed into an integral structure. The condenser tubes are of heavy gauge seamless brass of ⅜-in. outside diameter, to which sturdy copper fins are metallically bonded, assuring a permanent joint, and enhancing heat transfer from tube to fin. Top and bottom headers are cylindrical in shape and are constructed of heavy-walled seamless copper. The manufacturer states that this construction promotes structural strength as well as freedom from electrolytic deterioration.

Units are equipped with quiet, motor-driven fans, and all except the smaller sizes are fitted with a velocity generator, a "stationary fan" that is a part of the casing assembly, the purpose of which is to distribute the air leaving the fan equally over the entire area of the heating element. Streamlined deflectors are attached to the casing by screws and spring clips, permitting adjustment. Direct pipe suspension results in installation flexibility and economy, according to the manufacturer.

Modine unit heater

Units are available in 11 sizes, equipped with both constant speed and variable speed motors, ranging in capacity from 76 sq. ft. to 2015 sq. ft., equivalent direct radiator.

Combines Automatic and Manual Control for Radiators

To meet the requirements where completely automatic operation of radiator valves is not desirable, the

Modustat for automatic and manual control

Modustat, product of Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., has been improved by the addition of a manual operating range which permits normal hand setting of the valve in any position from full open to full closed, as with any hand valve.

When set to operate in the automatic range, any desired room temperature from 60° to 80° will be maintained without further attention, the valve automatically modulating to regulate the flow to exactly the amount of steam required. All settings for both automatic operation and manual control are readily made with the lever on top of the valve. The valve is available in models for concealed radiators and with key setting.

The manufacturer recommends use of the valve in such applications as hotel rooms, hospitals, and special commercial installations, where completely automatic operation of the heating equipment is unsatisfactory.

New Branford Burner Exhibited

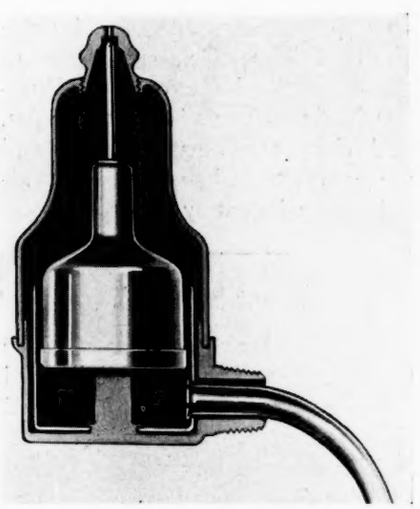
Malleable Iron Fittings Co., Branford, Conn., has made a number of improvements and refinements in the 1934 model of the Branford oil burner, on display for the first time at the Heating and Ventilating Exposition.

The manufacturers of the Branford burner claim to be the first to break away from the conventional method of building the belt-driven oil burner, by enclosing the entire mechanism in a solid one piece cast-iron housing, making the burner more compact and trim in appearance than others which operate on the same principle.

Hoffman Airport Vents

Hoffman Specialty Co., Inc., Chrysler Building, New York, has announced the No. 70 and 71 Airport radiator air valves, described by the manufacturer as efficient, high quality units for jobs where initial cost must be kept low.

In operating principle, this valve is similar to the company's No. 1 air valve. The vent is normally open for the free passage of air. When steam reaches the thermostatic float, the confined heat-sensitive fluid vaporizes, causing the flexible diaphragm base to expand with snap



No. 70 Airport vent

action, to raise the valve pin to its seat. Whenever air reaches the valve, its lower temperature reduces the pressure within the float, and the port opens for its escape. Should water surge into the valve, the float raises the valve pin, closing the vent. When the water in the radiator drops away from the valve, the float chamber drains through the siphon, permitting free venting of the air through dry channels.

No. 70 is of the angle type for cast-iron radiators, and No. 71 is of the straight-shank pattern for venting concealed-type convectors having the vent tap at the top of the header.

Gar-Wood Boiler-Burner

Wood Hydraulic Hoist & Body Co., Boiler Div., 7924-60 Riopelle St., Detroit, is announcing the Model R boiler-burner unit for small steam or hot water installations.

Burner is of the pressure atomizing type, electrically ignited, and thermostatically controlled. It is designed to burn No. 3 fuel oil efficiently. Boiler and burner are entirely encased in a lacquered steel jacket, completely insulated. A refractory hearth protects the burner, motor, and transformer from the heat of the combustion chamber. The output is given as 450 sq. ft. of direct steam radiator, or 720 sq. ft. of hot water surface.

Also announced by the same manufacturer is the Model H conversion oil burner, using No. 3 fuel oil, and of sufficient capacity for 450 sq. ft. of steam radiator.

Gar-Wood Model R boiler-burner

Crane Oil-Burning Boiler Has Unusual Features

Crane Co., 836 South Michigan Ave., Chicago, has developed the D-1 series oil-burning boiler, available in capacities up to 1400 sq. ft. of direct steam radiator. The boiler is designed for use with any gun-type burner, or it may be purchased from the manufacturer with a matched burner installed.

A revertible flue, formed by means of passes between the adjacent sections, applies the downdraft principle and provides secondary heating surface for absorbing the heat of the gases. These gases in the flue travel must cool before descending to the smokehood outlet, and in so doing, additional heat, often wasted up the stack, is transferred to the boiler water. The horizontal flues, to which the vertical flues conduct the gases of combustion, are below the combustion chamber, and the boiler is thus completely jacketed to the floor, with combustion chamber and flue areas completely surrounded by water. In this way, standby losses are minimized while the burner is not operating.

Crane oil-burning boiler

Armstrong Traps Improved

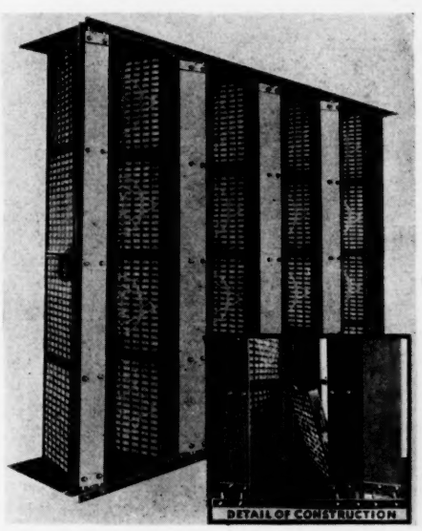
Armstrong Machine Works, Three Rivers, Mich., has announced the No. 200 inverted bucket-type steam trap, offering improvements over the No. 100 trap which it supersedes. The new trap has an unbreakable plug-type valve seat, and is equipped with a pipe plug in the cap which serves as a handy test outlet. Inlet and discharge, located in the trap body, are horizontal and diametrically opposite. Maximum working pressure is 125 lb. per sq. in., and the trap will handle from 400 lb. to 690 lb. of condensation per hour.

Similar in capacity and design is the No. 201 trap, having angle connections with inlet horizontal and discharge downward at the bottom of the trap body, for convenience in installation. Both may be equipped with automatic air bypass.

"V" Frames for Dustop Filters

A "V" type filter frame has been developed by Owens-Illinois Glass Co., Toledo, Ohio, for use with Dustop replacement type glass wool filters used in the ventilating and air conditioning systems of commercial and industrial buildings. The manufacturer states that this V-frame filter arrangement saves 40% of the frontal area required by the full flat intake filter frame for similar capacity, of Owens-Illinois manufacture.

Filter units, 20 in × 25 in. × 2 in., each of 1000 c.f.m. capacity, are supported in a steel frame, arranged



V type frame for Dustop filters

in a series of angles carefully worked out to avoid turbulence of air flow. The uniform throat opening into the V-frame is said to be accurately proportioned to provide uniform distribution of air over the exposed filter faces.

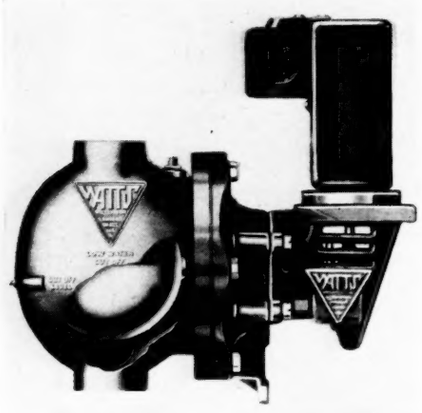
It is claimed that this assembly results in a sturdy, rigid, and free-standing unit. The frames are equipped with an improved lock which exerts a positive pressure on the outer edge of the filter cells forcing them back against the flange seat for the discharge face of the frames, assuring an air-tight seal.

Watts Shows Boiler Control

Watts Regulator Co., Lawrence, Mass., is exhibiting its recently announced No. 90 gauge glass type low water cut-off at the Heating and Ventilating Exposition.

This safety control is designed to allow for easy and inexpensive installation into the gauge glass tappings, and is adjustable to fit all gauge glass mountings. A heavy seamless copper float operates a lever to trip the switch controlling the automatic firing device in the event of low water. The cut-off is fitted with a hydraulically-formed corrosion-proof bellows seal. It is available for pressures up to 75 lb., and with pressure cut-off for pressures up to 15 lb.

Also on display are the new gauge glass type feeders, No. 60, and the No. 147 circulator for hot water systems.

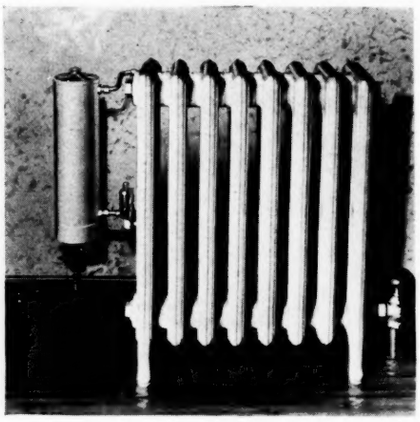


Watts low water cut-off, No. 90

Humidifier Attached to Radiators

To meet the demand for a popular priced humidifier for homes and buildings, the American Radiator Co., 40 West 40th St., New York, has placed on the market the Arco Humidifier "A," a humidifying attachment for existing radiators on either steam or hot water systems.

This attachment is fastened to the end of the radiator so that the heating medium, either steam or hot water, flows through a coil immersed in water, bringing the water near the boiling point and causing constant vaporization. Included in the unit is an electrical heating element that can be used as an auxiliary source of heat for vaporization on hot water systems or on steam systems when the boiler is operating with very little pressure.

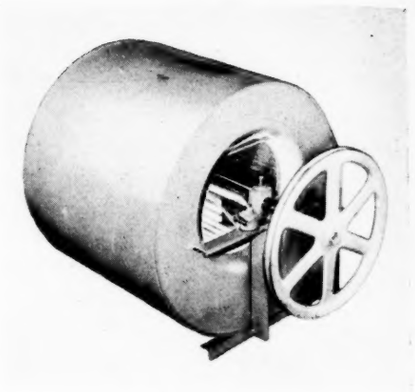


Arco Humidifier "A" attached to a radiator

A cylinder surrounding the coil is filled with water and an automatic switch turns off the electrical element should it be working when all the water is evaporated. The unit, made of brass with nickel finish, can be attached by simply removing two small screw plugs from the end of the radiator and screwing the compression fittings on the humidifier into two tapped holes that already exist. On old style radiators that do not have the holes found on recent models, the humidifier can be attached by tapping two holes in the end of the radiator.

New Furnace Blower Announced

AC blowers, for forced-air heating and air conditioning systems, new product of Air Controls Inc.,



AC furnace blower

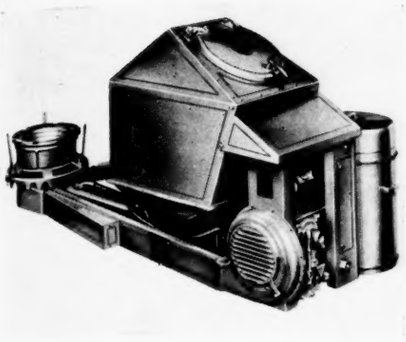
Div. of The Cleveland Heater Co., 1960 West 114th St., Cleveland, are on display at the Heating and Ventilating Exposition.

These blowers, developed for use by furnace manufacturers and makers of air conditioning equipment as an integral part of their products, are said by the manufacturer to have an unusually stable pressure and volume characteristic, maintaining the delivery volume within close limits with varying static pressures. The scroll casing was designed for quiet operation, and the low speed wheel revolves in rubber-mounted, self-aligning bearings. Thermo-porous bronze bushings are used, requiring but one oiling per season. Four sizes are available, with capacities properly proportioned to correspond to the popular sizes of air conditioning equipment.

Stoker Removes Ashes

On display at the Heating and Ventilating Exposition exhibit of the Iron Fireman Manufacturing Co., 3170 West 106th St., Cleveland, is a new anthracite burner with automatic ash remover. This stoker is available in three sizes, having capacities of 20 lb., 35 lb., and 50 lb. per hr., retorts being respectively 15 in., 18 in., and 22 in. in diameter.

This is an underfeed type of stoker in which coal is conveyed by a revolving worm from a sheet metal hopper of 400 lb. capacity into the base of a circular retort. Here the coal is forced upward and burns slowly as it passes through the retort, air for combustion being supplied by a blower. The ash falls, or is scraped from the outer edge of the retort by a slowly revolving



Iron Fireman with ash remover

wiper, and is picked up by the ash conveyor worm and delivered to a closed receptacle outside the heater.

Three rates of coal feed are obtainable with the variable speed transmission, which is driven by a V-belt. The air volume is adjustable to the combustion rate by means of a shutter at the blower intake.

A line of stokers of similar capacities, without ash remover, is also manufactured by the same company. The exhibit includes a larger industrial unit for use with bituminous coal.

Friez Shows Refinements In Control

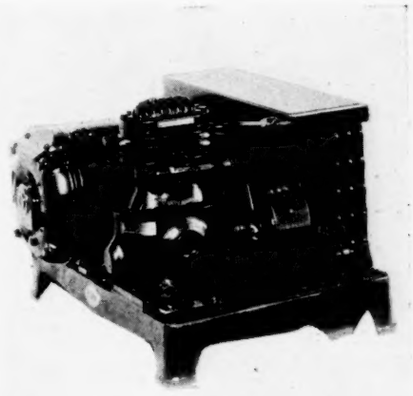
Julien P. Friez & Sons, Inc., Baltimore St. and Central Ave., Baltimore, Md., is announcing unusually comprehensive lines of air conditioning control and indicating and recording instruments at the Heating and Ventilating Exposition, Grand Central Palace, New York.

Among these will be found the Friez humidistat, Types H/2 — H/10, inclusive, utilizing multiple human hair hygroscopic elements, and available with a large variety of contacting arrangements whereby all types of electrical control can be achieved. These instruments, adaptable to controlling both humidifying and dehumidifying apparatus, are mounted in pressed aluminum cases of attractive finish. Adjustment is effected by means of a knob and rotating dial. Similar in appearance is the new Friez thermostat, with bi-metallic element, companion instrument to the humidistat.

Other new equipment displayed by this manufacturer includes the Comfortrol, or effective temperature controller, providing complete regulation of temperature and humidification in terms of the A.S.H.V.E. comfort chart. The Friez recorder for temperature, humidity, and operation, housed in a compact, rugged case, approximately 6 in. × 8½ in., provides clear and accurate records on rectangular charts in index card form for convenient filing. The manufacturer styles this an invaluable instrument for those engaged in test, sales, installation, and service of all kinds of heating, ventilating, and air conditioning equipment.

Latest York Conditioners on Exhibition

York Ice Machinery Corp., York, Pa., is exhibiting its newly revised



York freon compressor with air-cooled condenser

and improved line of air conditioning equipment at the Heating and Ventilating Exposition, Grand Central Palace, New York.

Included are ceiling-type conditioners, enclosed in attractive modern casings, and supported on inconspicuous angle brackets. A large horizontal unit, for either floor or ceiling installation, the recently announced freon compressors with air-cooled condensers, and the new basement-type air conditioning units, assembled within compact cabinets, are also on display.

Emerson Improves Split Phase Motors

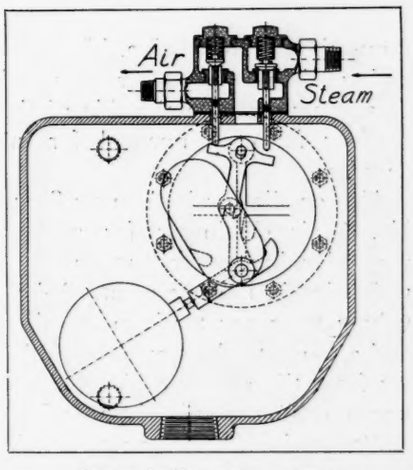
The Emerson Electric Mfg. Co., 2018 Washington Ave., St. Louis, is exhibiting an improved line of split phase, steel field ring motors at the Heating and Ventilating Exposition. These motors, designated Type S, are recommended by the manufacturer for powering oil burners, fans, blowers, and similar appliances where the starting load is not greatly in excess of the running load.

Stator is of laminated steel construction, assembled as an integral unit under high pressure, with steel field ring welded around the laminations. Rotor is similarly constructed of laminated punchings, held together by copper conductors and assembled under hydraulic pressure. Rotors are ground to accurate dimensions from the shaft centers, resulting in accurate balance and uniform air gap.

The stator has a main field winding and also a phase or starting winding. At a predetermined speed, a positive, quick-acting cut-out opens the phase circuit and the motor runs as a standard induction unit, without contact between field and armature. Bearings are lubricated by wool-packed oil reservoirs, of sufficient capacity for a year's continuous operation. For applications requiring extremely quiet performance, resilient cushion-type mountings are available.

Sarco Exhibits Recent Developments

Sarco Co., Inc., 183 Madison Ave., New York, is showing at



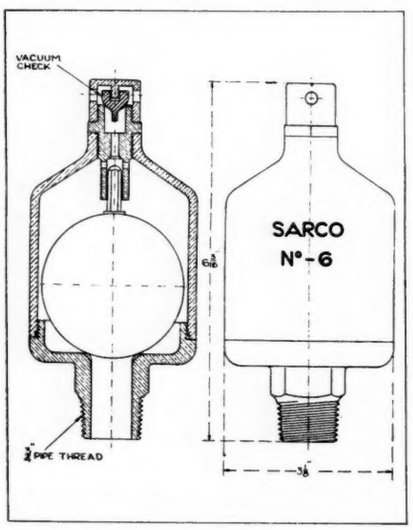
Sarco boiler return trap

New Equipment

Grand Central Palace for the first time the new Sarco boiler return trap, an alternating receiver for use in vapor heating systems having up to 1500 sq. ft. of equivalent direct radiator.

This is a completely enclosed unit. Inlet and outlet are through the same opening in the bottom. When the receiver is filled to a given level, a heavy copper float in the body trips a weight which closes the air vent valve and opens the steam valve, applying boiler pressure to the receiver. The trap is installed above the boiler water level, and gravity returns the condensation to the boiler, dropping the float to reverse the valve mechanism, starting a new cycle.

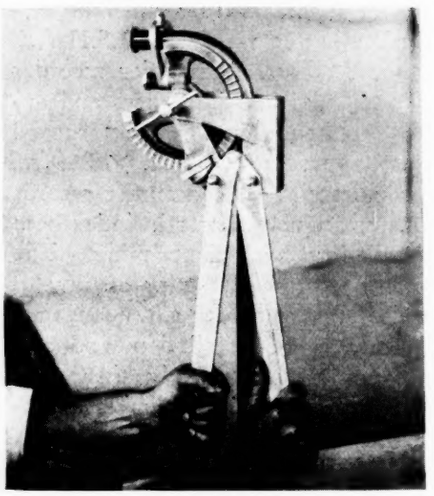
Valves are mounted together in a



Sarco No. 6 air eliminator

single compact casting bolted to the top of the receiver and are readily removable for inspection. The float and weight mechanism are attached to a cover plate on the side of the receiver for easy removal for inspection.

Also on display is the new Sarco No. 6 air eliminator for venting vapor heating systems at one central point in the basement. A ball valve prevents water from escaping, and a separate check valve excludes air from the system while under a vacuum. Capacity is given as 2000 sq. ft., equivalent direct steam radiator.



Bending brass pipe with Hays machine

Machine Bends Copper Pipe

Hays Manufacturing Co., Erie, Pa., is marketing a machine for bending hard or soft tempered copper tubing and pipe. It is available in four sizes, for ⅜-in., ½-in., ¾-in., and 1-in. pipe, with bending radii of 1½ in., 2¼ in., 3 in., and 4 in., respectively.

A notched circular forming block is clipped to the pipe, and the bend is made by forcing the detachable lever handles together. The pipe may be bent at any point along its length and to any angle up to 180°. The tool is constructed entirely of malleable iron and steel.

Staynew Has Window Ventilator

A window ventilator unit, combining motor-driven fan, filter, and silencing device, is being marketed by Staynew Filter Corp., Rochester, N. Y., under the name of Protectovent. It is easily installed in any vertically-sliding, double-hung window, all joints being made tight by soft felt insulation.

Filter is of Staynew Multi-V-type construction, using a cotton medium, reinforced. Fan is of aluminum construction, having a capacity of 200 c.f.m. An adjustable air deflector controls direction and volume of air flow and dampens outside noises.

Units are available for a wide range of window sizes, in one-, two-, and three-fan models.

Jones & Laughlin Seamless Boiler Tubes

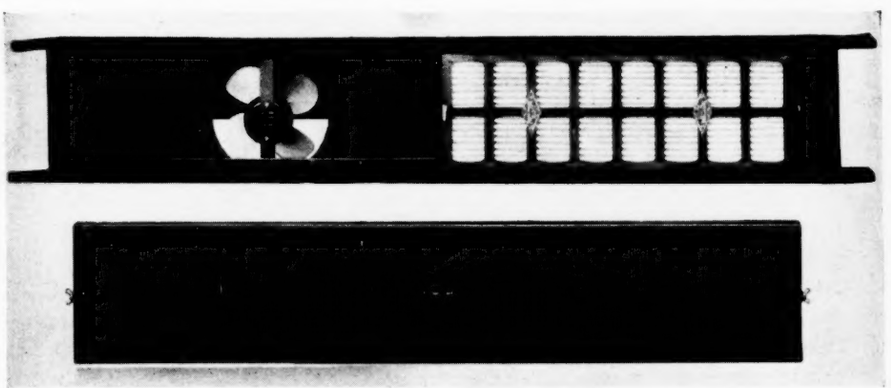
Jones & Laughlin Steel Corp., Pittsburgh, Pa., is exhibiting a new line of hot-rolled seamless steel boiler tubes at the Heating and Ventilating Exposition.

It is stated by the manufacturer that an unusually high quality is imparted to the steel by the manufacturing process, accomplished on a push-bench mill unique in this country. The tubes are further said to possess exceptional ductility, rendering them readily adaptable to bending and rolling operations. Inside and outside surfaces are smooth, an important factor in retarding corrosion in use and storage, according to the manufacturer.

Worthington Improves Compressors

Worthington Pump and Machinery Corp., Harrison, N. J., announces an improved series of two-cylinder vertical compressors for ammonia and freon, in capacities ranging from 1 ton to 100 tons of refrigeration.

Suction valves are located in the top of the pistons, and discharge valves operate in an easily remov-



Protectovent with one filter removed, showing fan and motor. Silencing plate below.

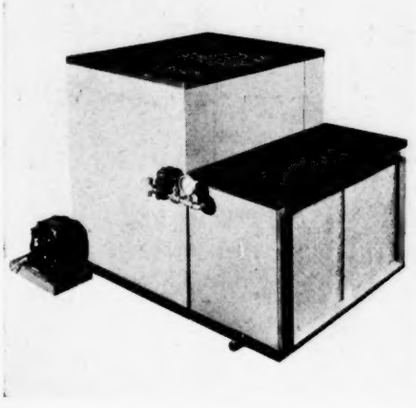
able safety head, providing maximum valve areas. Main stop valve, pump-out valve, safety valve, and starting by-pass are incorporated in a self-contained manifold furnished as a part of the complete unit. Tapered rollers are used in the main bearings, and a straight roller type is used in the outboard bearing. Drive can be either direct-connected with synchronous motor, or through Worthington Multi-V-drive.

Summer and Winter Forced-Air System

A summer and winter forced-air conditioning unit, the Balmi-Aire, for use in conjunction with warm-air heating systems has been placed on the market by the United States Air Conditioning Corp., Minneapolis, Minn.

Unit comprises two separate chambers, containing respectively a filter and blower and a washer and humidifier. The blower wheel is of the forward curved blade type, designed for maximum delivery at slow and quiet speeds. It is belt-driven through an adjustable speed motor pulley. Dustop glass wool filters remove foreign matter from incoming air.

The washer-humidifier unit is attached to the discharge side of the blower-filter unit, and is of the spray type. Excess water is drained through a pipe at the bottom, and a spun glass eliminator mat at the outlet prevents entrained moisture from entering the furnace casing. The Balmi-Aire conditioner is made in four sizes, discharge capacities ranging from 1600 c.f.m. to 4000 c.f.m.



Balmi-Aire conditioner

Refrigerant unloader

Unloader for Refrigeration Compressors

A small instantaneous automatic unloader for use with synchronous motor-driven refrigeration compressors has been developed by Electric Machinery Mfg. Co., Minneapolis, Minn. Used in conjunction with automatic start and stop control of the motor, this device removes the necessity of manually by-passing the compressor when the motor starts up. It also permits less close attention by the operator, and enables the compressor to continue in operation through momentary current interruptions and voltage dips.

Valve is connected between the suction and discharge on the compressor, and is operated by a pressure differential in the refrigerant. This differential is regulated by a magnetic pilot valve controlled by the frequency-responsive relay on the starting panel. When the motor is started, a small amount of high-pressure ammonia is released from the unloader to actuate it. This gas is returned to the low-pressure side without leakage or waste.

New Copper Fittings Announced

Anaconda cast bronze soldered fittings, and flared tube fittings, recently placed on the market by The American Brass Co., 25 Broadway, New York, are being shown for the first time at the International Heating and Ventilating Exposition, February 5-9, Grand Central Palace, New York.

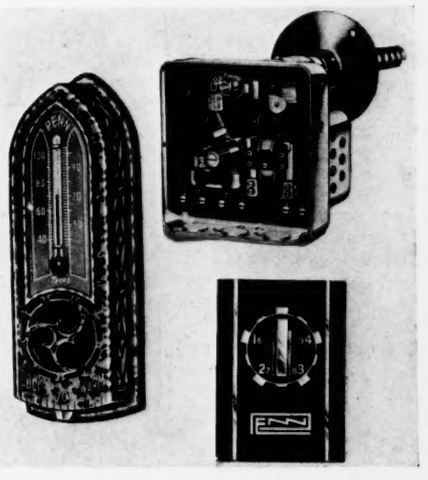
These fittings are for use with Anaconda deoxidized copper water tubes and are cast of an alloy which possesses practically the same coefficient of expansion as pure copper, and a proper relationship of thermal conductivity.

Penn Oil Burner Control

Penn Electric Switch Co., Des Moines, Iowa, is announcing the Penn control system for oil burners, combining a day and night thermostat, a stack safety ignition control, and the Penn Mark-Time switch.

A single bi-metal helix operates the thermostat, which is provided with a simple adjustment by which the temperature in the room in which it is installed may be maintained uniform without differential, according to the manufacturer. The differential between day and night operation may be set for from 2° to 15°.

Transition from day to night operation is accomplished by the Mark-Time switch, which is tied into the thermostat circuit. When desirous of switching to night operation, the householder sets the dial on the switch to the mark representing the number of hours during which the low temperature operation is to continue. This winds and sets a mechanical timing device which switches the thermostat to day operation when the time interval has elapsed.



Penn oil burner control. Mark-Time switch, lower right.

December Degree-Days in East More Than Last Year, Less in Mid-West

	Atlanta	Baltimore	Birmingham	Boston	Buffalo	Chicago	Cincinnati	Cleveland
Degree-days for December, 1933.....	410	837	287	1184	1172	981	821	973
Degree-days, Sept. 1, 1933 to Dec. 31, '33	901	1668	672	2423	2640	2219	1825	2153
Degree-days, Sept. 1, 1932 to Dec. 31, '32	1208	1553	1080	1853	2321	2429	2014	2085
Comparison, season to date with last, %	— 25.4	+ 7.4	— 37.8	+ 30.7	+ 13.7	— 8.6	— 9.4	+ 2.8
Degree-days, Sept. 1 to Dec. 31, Normal	1131	1664	913	2130	2371	2225	1784	2185
Comparison, season to date with nor'l, %	— 20.4	Same	— 26.4	+ 13.7	+ 11.4	Same	+ 2.3	— 1.5
Lb. coal per sq. ft. rad., December, 1933	3.280	6.696	2.296	9.472	9.376	7.848	6.568	7.784
Gal. oil per sq. ft. rad., December, 1933	0.281	0.574	0.197	0.812	0.804	0.673	0.563	0.667
Cu. ft. gas per sq. ft. rad., Dec., 1933..	39.36	80.35	27.55	113.66	112.51	94.18	78.82	93.41

	Davenport	Dayton	Denver	Des Moines	Detroit	Duluth	Fort Wayne	Grand Rapids
Degree-days for December, 1933.....	1084	863	658	1124	1090	1749	1048	1150
Degree-days, Sept. 1, 1933 to Dec. 31, '33	2312	2041	1508	2365	2422	3912	2356	2580
Degree-days, Sept. 1, 1932 to Dec. 31, '32	2579	2119	2517	2821	2392	3808	2453	2493
Comparison, season to date with last, %	— 10.4	— 3.7	— 40.1	— 16.2	+ 1.3	+ 2.7	— 4.0	+ 3.5
Degree-days, Sept. 1 to Dec. 31, Normal	2333	1947	2276	2370	2332	3434	2220	2397
Comparison, season to date with nor'l, %	— 0.9	+ 4.8	— 33.8	Same	+ 3.9	+ 14.2	+ 6.1	+ 7.6
Lb. coal per sq. ft. rad., December, 1933	8.672	6.904	5.264	8.992	8.720	13.992	8.384	9.200
Gal. oil per sq. ft. rad., December, 1933	0.743	0.592	0.451	0.771	0.747	1.199	0.719	0.789
Cu. ft. gas per sq. ft. rad., Dec., 1933..	104.06	82.85	63.17	107.90	104.64	167.90	100.61	110.40

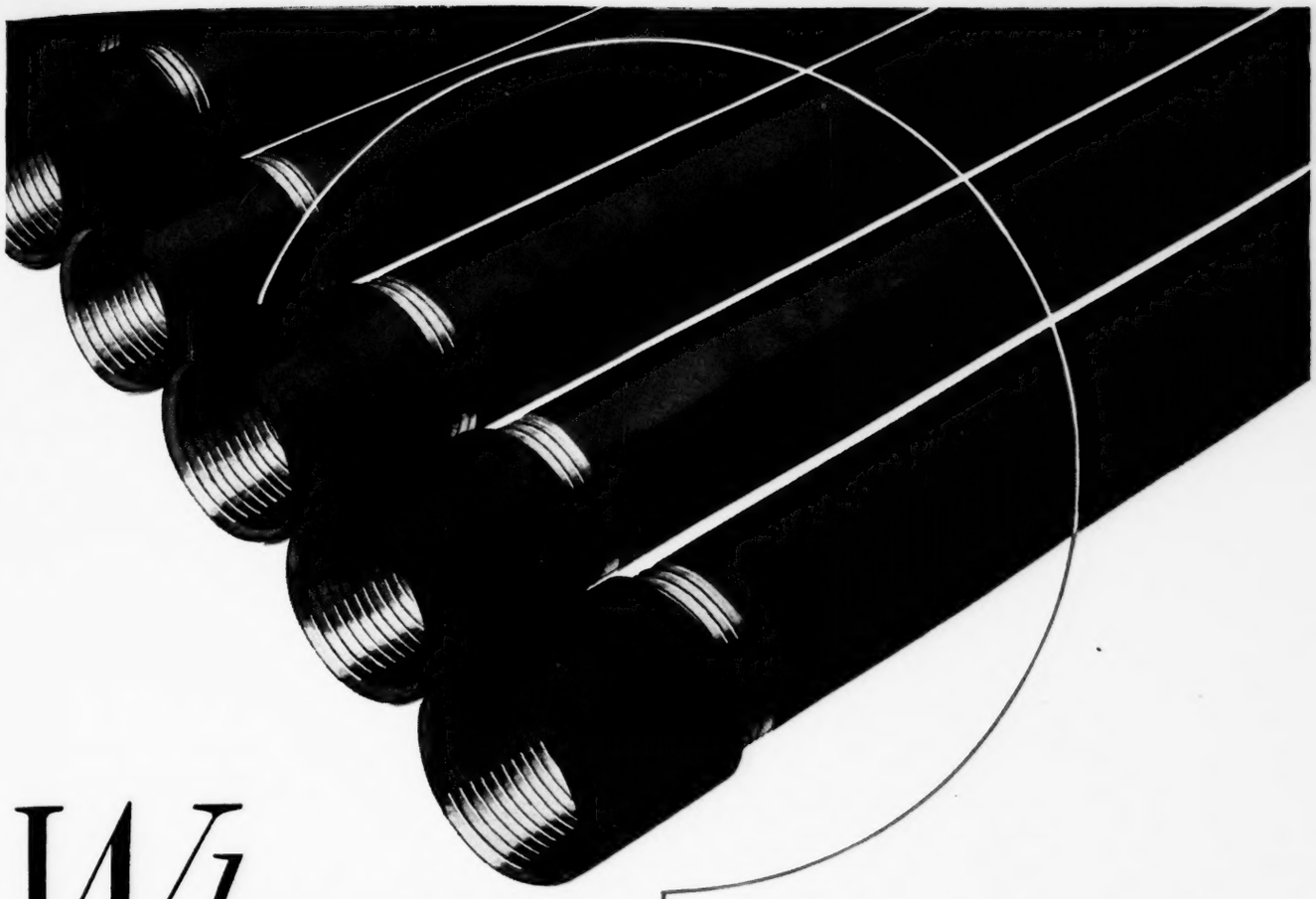
	Harrisburg	Hartford	Indianapolis	Kansas City	La Crosse	Los Angeles	Louisville	Memphis
Degree-days for December, 1933.....	997	1195	900	808	1339	249	726	485
Degree-days, Sept. 1, 1933 to Dec. 31, '33	2141	2473	1988	1592	2911	423	1574	963
Degree-days, Sept. 1, 1932 to Dec. 31, '32	1996	2086	2215	2186	3130	358	1813	1428
Comparison, season to date with last, %	+ 7.3	+ 18.5	— 10.3	— 27.2	— 7.0	+ 18.1	— 13.2	— 32.6
Degree-days, Sept. 1 to Dec. 31, Normal	1981	2157	2002	1809	2778	424	1587	1127
Comparison, season to date with nor'l, %	+ 8.1	+ 14.6	— 0.7	— 12.0	+ 4.8	Same	— 0.8	— 14.5
Lb. coal per sq. ft. rad., December, 1933	7.976	9.560	7.200	6.464	10.712	1.992	5.808	3.880
Gal. oil per sq. ft. rad., December, 1933	0.684	0.819	0.617	0.554	0.918	0.171	0.498	0.333
Cu. ft. gas per sq. ft. rad., Dec., 1933..	95.71	114.72	86.40	77.57	128.54	23.90	69.70	46.56

	Milwaukee	Minneapolis	New Haven	New Orleans	New York	Omaha	Peoria	Philadelphia
Degree-days for December, 1933.....	1195	1491	1110	98	994	1043	1005	893
Degree-days, Sept. 1, 1933 to Dec. 31, '33	2585	3127	2287	193	2011	2124	2203	1766
Degree-days, Sept. 1, 1932 to Dec. 31, '32	2677	3239	1964	549	1733	2590	2504	1556
Comparison, season to date with last, %	— 3.4	— 3.5	+ 16.4	— 64.9	+ 16.0	— 18.0	— 12.0	+ 13.5
Degree-days, Sept. 1 to Dec. 31, Normal	2601	2941	2109	403	1849	2284	2323	1733
Comparison, season to date with nor'l, %	— 0.6	+ 6.3	+ 8.4	— 52.1	+ 8.8	— 7.0	— 5.2	+ 1.9
Lb. coal per sq. ft. rad., December, 1933	9.560	11.928	8.880	0.784	7.952	8.344	8.040	7.144
Gal. oil per sq. ft. rad., December, 1933	0.819	1.022	0.761	0.067	0.682	0.715	0.689	0.612
Cu. ft. gas per sq. ft. rad., Dec., 1933..	114.72	143.14	106.56	9.41	95.42	100.13	96.48	85.73

	Pittsburgh	Portland, Ore.	Providence	Reading	Rochester	St. Louis	Salt Lake City	San Francisco
Degree-days for December, 1933.....	922	566	1145	982	1165	772	786	450
Degree-days, Sept. 1, 1933 to Dec. 31, '33	2051	1534	2383	1989	2622	1601	1683	864
Degree-days, Sept. 1, 1932 to Dec. 31, '32	1995	1632	1959	1914	2276	1952	2360	896
Comparison, season to date with last, %	+ 2.8	— 6.0	+ 21.6	+ 3.9	+ 15.2	— 18.0	— 28.6	— 3.6
Degree-days, Sept. 1 to Dec. 31, Normal	1949	1724	2129	2014	2414	1738	2149	949
Comparison, season to date with nor'l, %	+ 5.2	— 11.0	+ 11.9	— 1.2	+ 8.6	— 7.9	— 21.6	— 9.0
Lb. coal per sq. ft. rad., December, 1933	7.376	4.528	9.160	7.856	9.320	6.176	6.288	3.600
Gal. oil per sq. ft. rad., December, 1933	0.632	0.388	0.785	0.673	0.799	0.529	0.539	0.309
Cu. ft. gas per sq. ft. rad., Dec., 1933..	88.51	54.34	109.92	94.27	111.84	74.11	75.46	43.20

	Scranton	Seattle	Spokane	Syracuse	Toledo	Trenton	Washington, D. C.	Wichita
Degree-days for December, 1933.....	1120	614	842	1202	1061	1016	824	737
Degree-days, Sept. 1, 1933 to Dec. 31, '33	2481	1729	2284	2688	2369	2102	1709	1387
Degree-days, Sept. 1, 1932 to Dec. 31, '32	2256	1779	2509	2234	2395	1803	1654	2018
Comparison, season to date with last, %	+ 10.0	— 2.8	— 9.0	+ 20.3	— 1.1	+ 16.6	+ 3.3	— 31.3
Degree-days, Sept. 1 to Dec. 31, Normal	2274	1881	2583	2491	2189	1760	1741	1783
Comparison, season to date with nor'l, %	+ 9.1	— 8.1	— 11.6	+ 7.9	+ 8.2	+ 19.4	— 1.8	— 22.2
Lb. coal per sq. ft. rad., December, 1933	8.960	4.912	6.736	9.616	8.488	8.128	6.592	5.896
Gal. oil per sq. ft. rad., December, 1933	0.768	0.421	0.577	0.824	0.728	0.697	0.565	0.505
Cu. ft. gas per sq. ft. rad., Dec., 1933..	107.52	58.94	80.83	115.39	101.86	97.54	79.10	70.75

Fuel consumption figures given above are based on certain conditions, and for other conditions corrections must be made. The figures assume the use of steam radiators emitting 240 B.t.u. per sq. ft. per hr., a system operating at 100% efficiency, and radiators calculated for maintaining 70° in zero weather. Heating values assumed for the fuels are 12,000 B.t.u. per lb. for coal, 1000 B.t.u. per cu. ft. for gas, and 140,000 B.t.u. per gal. for oil. To correct for other heating values, efficiencies, and design conditions, follow the method explained in the "Heating and Ventilating Degree-Day Handbook."



What price HOMOGENEITY

In the course of a year, Republic salesmen are many times asked the question, "Why should we pay a premium for Toncan Iron Pipe?"

The answers, "Because it lasts longer," and "Because it is worth it for economy reasons," are true, but there's a better answer.

The premium you pay for Toncan Iron is the price you pay for homogeneity—perfect uniformity. Toncan Iron is an alloy of refined iron, copper and molybdenum—and please don't confuse it with copper-bearing steel. To make such an alloy requires experience, more expensive materials and costly time. Severe specifications control the material charged into the open hearth. The refining of the iron and the addition of the copper and molybdenum at the right time are real accomplishments. Skilled ingot practice prevents the segregation of the metalloids and the inclusion of foreign solids and gases. And here is the result—an alloy that is homogeneous—in which every portion of the metal is the same throughout and equally resistant to rust—a resistance that is surpassed among the ferrous metals only by the stainless irons and steels.

That briefly is the real answer to the question—"Why should we pay more for Toncan Iron Pipe," and after a trial in service has proved its economy, its real worth is quickly apparent.

Write for a copy of the new edition of "Pipe for Permanence."

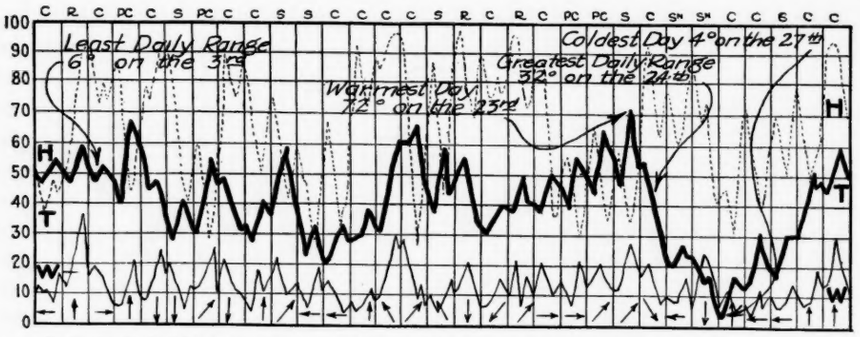
TONCAN
COPPER MO-LYB-DEN-UM
IRON PIPE

REPUBLIC STEEL CORPORATION

GENERAL OFFICES YOUNGSTOWN, OHIO

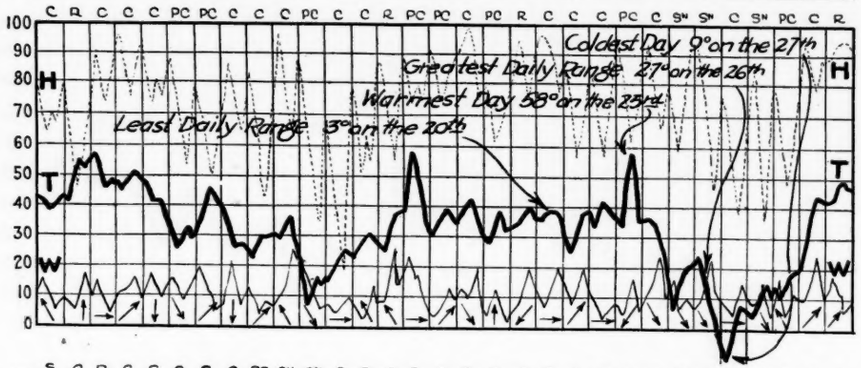
THE WEATHER FOR DECEMBER, 1933

Plotted from records especially compiled for HEATING AND VENTILATING by the U. S. Weather Bureau. Heavy curves (T), temperatures in deg. F.; dotted lines (H), per cent relative humidity, from readings at 8 a.m., noon, and 8 p.m., except for New York, which shows hourly readings. Light lines (W), wind velocity in m.p.h. Arrows indicate prevailing wind directions. S—clear; PC—partly cloudy; C—cloudy; R—rain; Sn—snow.



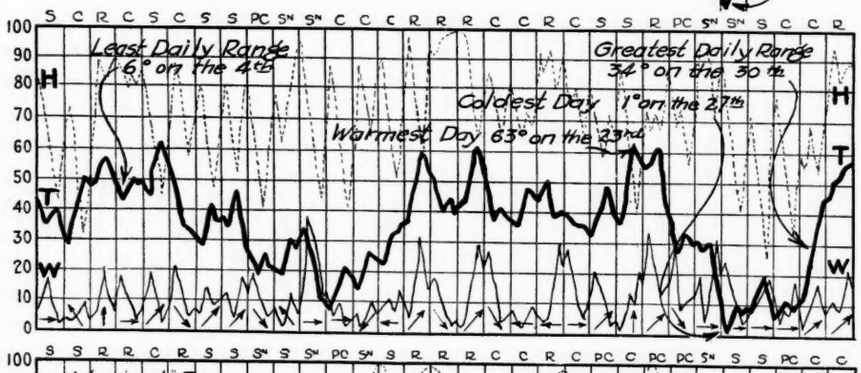
St. Louis

Mean temp. for month, 40.2°; aver. wind velocity, 12.3 m.p.h.; prevailing direction of wind, S.



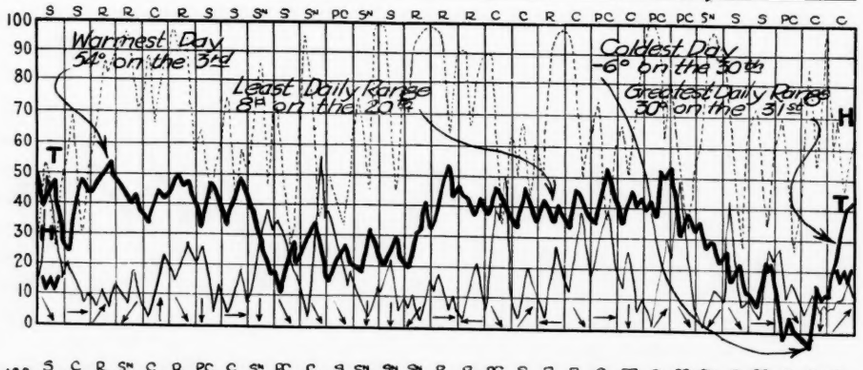
Chicago

Mean temp. for month, 31.3°; aver. wind velocity, 10.8 m.p.h.; prevailing direction of wind, N.W.



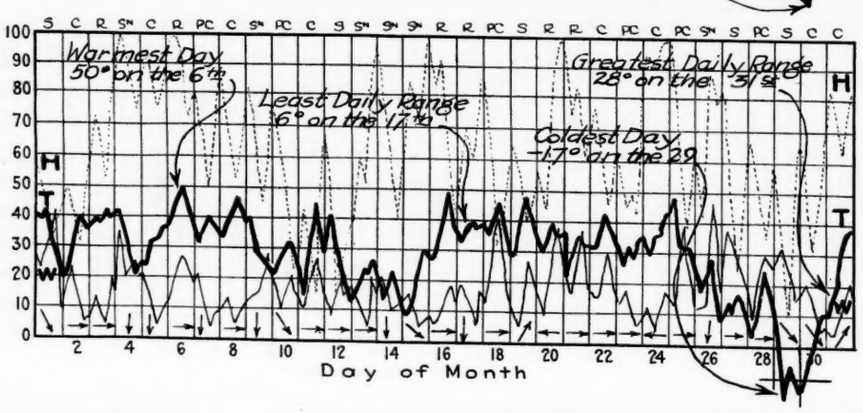
Pittsburgh

Mean temp. for month, 35.3°; aver. wind velocity, 10.8 m.p.h.; prevailing direction of wind, W.



New York

Mean temp. for month, 32.9°; aver. wind velocity, 14.2 m.p.h.; prevailing direction of wind, N.W.


Warmest Day 50° on the 6th
Least Daily Range 16° on the 17th
Greatest Daily Range 28° on the 31st
Coldest Day -17° on the 29
H
T
W
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

Boston

Mean temp. for month, 26.8°; aver. wind velocity, 15.7 m.p.h.; prevailing direction of wind, W.

DELANO & ALDRICH....

follow Service Records in specifying

Wrought Iron Pipe

certainty with which leading architects ite mechanical specifications is a tribute eir progressiveness in engineering as well sign. There is a growing tendency to rely rvice records as a guide — an assurance he proper material is specified where it ost economically serve the client.
e, a key building material, may be sin- out as an excellent example of where progress is being made in specification writing.

Illustrated here are examples of where Delano & Aldrich of New York specify wrought iron for the services where past performance has proved it longer lived and more economical.

This engineering practice of specifying a kind of pipe on its performance record, we call "Pipe Prescription." We have a wealth of service data, collected with the aid of leading architects and engineers, to back up the specification of wrought iron in corrosive services.

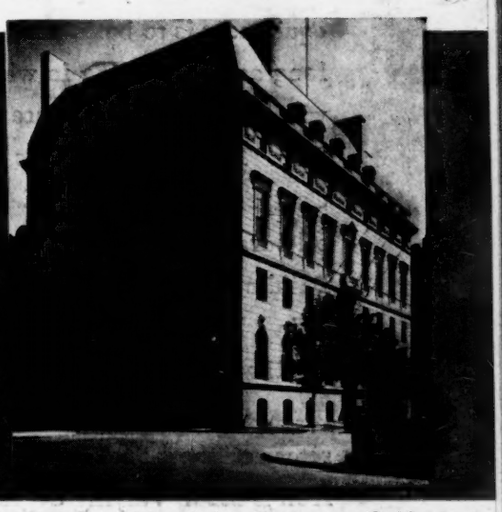
If you would like to review some of this material, just ask a Byers Engineer or write our Engineering Service Department for "Service Records of Plumbing, Heating and Refrigeration Lines." A. M. Byers Company, Established 1864. Pittsburgh, Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Los Angeles.

NRA

Typical Examples of "Pipe Prescription" as practiced by DELANO & ALDRICH New York Architects

Genuine Wrought Iron Pipe was specified waste lines and vents in the G. F. Baker, Jr. idence, New York City.

● In the U. S. Embassy, Paris, France, Genuine Wrought Iron Pipe was specified for main plumbing supply, waste lines, vents and drains and heating supply and return lines.



● Genuine Wrought Iron Pipe was specified for waste lines, vents, main soil lines and sewer connections in the Union Club House, New York City.

BYERS GENUINE WROUGHT IRON PRODUCTS

PIPE • WELDING FITTINGS • RIVETS • SPECIAL BENDING PIPE • BAR IRON
PLATES • SHEETS • CULVERTS • FORGING BILLETS • STRUCTURALS

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